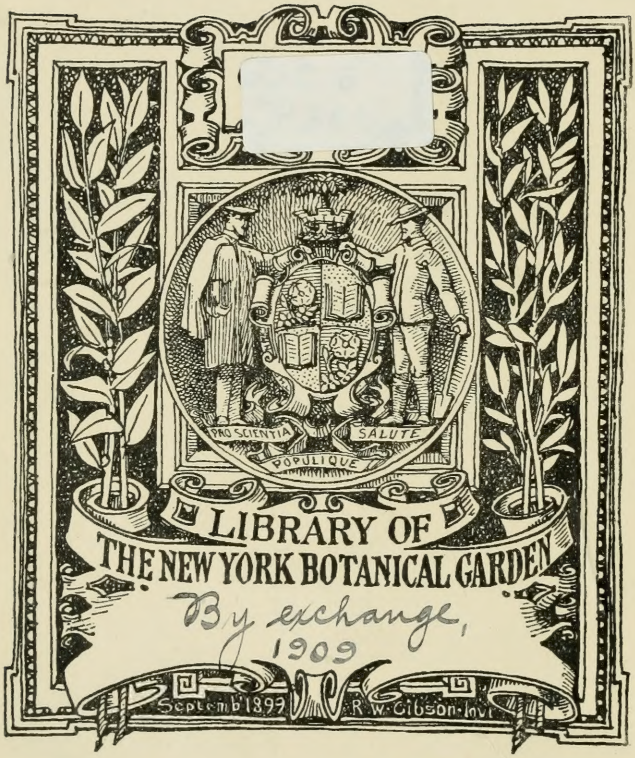

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THIRTEENTH ANNUAL REPORT

OF THE

PENNSYLVANIA

DEPARTMENT OF AGRICULTURE.

1907.

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MARY E. CHADWICK, Stenographer, State Veterinarian,
Harrisburg.

JAN 26 1909

THIRTEENTH ANNUAL REPORT

OF THE

Secretary of Agriculture.

Department of Agriculture, Harrisburg, Pa., January 1, 1908.

To his Excellency, Hon. Edwin S. Stuart, Governor of Pennsylvania:

Sir: In compliance with the requirements of the Act of Assembly creating a Department of Agriculture of Pennsylvania, I have the honor to submit my report of said Department for the year ending December 31, 1907.

The past year has demonstrated that the advanced era in agricultural development, to which reference was made in a preceding report of this Department, has been reached and it is to be hoped that the progress made will be permanent.

The importance of employing improved methods is being recognized and everywhere those engaged in the various branches of agriculture are seeking more light. There never was a time when farmers felt as they now feel the importance of knowing more concerning the laws governing plant growth, stock breeding and all the operations conducted upon the farm. This desire for information, is in some measure, met by the Farmers' Institutes held throughout the State, and the agricultural press. These important agencies, however, perform their greatest service by leading the younger men who expect to devote themselves to cultivating the soil to seek the best possible opportunities for self-improvement along the lines they have chosen for their life-work.

Pennsylvania has always been prominent as an agricultural State. During her colonial period the military campaign that resulted in wresting all the territory within her borders from the French government, was directed to move through Pennsylvania because of the possibility of subsisting the army and its baggage trains upon the fruits of the well cultivated farms of the colony. Pennsylvania was among the foremost of the colonies in bearing the burden of feeding and otherwise supporting Washington's army in the struggle for Independence. During the Civil War it was General Robert E. Lee's knowledge of the well filled barns of Pennsylvania farmers and the fine herds of cattle grazing upon their fields that led him to make the strenuous effort he did to get his army firmly established in this State, and to make Pennsylvania, instead of Virginia the seat of war so far as his army was concerned. When the Civil War closed and Pennylvania again started with renewed energy upon her grand career as a great manufacturing and mining state, her agriculture was not permitted to suffer. The thousands of men employed in her mines and mills gave to the Pennsylvania farmer the best home market to be found in any state of the Union.

The geographical position of the State, its watercourses, its transportation facilities and its relation, so far as location is concerned, to other states give to it opportunities as an agricultural state enjoyed by few. Because of these favorable circumstances, its agriculture has been developing in the past and this development is destined to continue. By intelligent cultivation, Pennsylvania farms are increasing in fertility, the yield of crops produced is growing larger, the homes of Pennsylvania farmers are being made better and the condition of their inmates is being improved.

CORN CULTURE IN PENNSYLVANIA.

No better evidence of the fact that our farmers are seeking better methods is needed, than is found in the advancement that has been made in the production of cereal crops in the State, and especially of the corn crop. It has been my privilege on several occasions to visit farms in the eastern part of the State whose owners are noted for their success in corn culture. Some of the more successful of these farmers claim that their crop yield has reached 120 bushels of shelled corn per acre. These farmers have learned the importance of improving the varieties they grow by systematic breeding as well as improved methods of cultivation, and their growing crops when seen presented a singular contrast with the crops of such of their neighbors as were content with old methods and satisfied with a crop of less than one-half of that grown under the improved conditions referred to. As already intimated this remarkable success was not the work of a single year, but the result of a series of years of close study and intelligent application.

The same persons were securing like satisfactory results in the cultivation of wheat, oats and potatoes. The careful selection of seed, the introduction of new varieties, the study of climatic conditions and influences, the adaptability of varieties to locality and other matters of equal import were all duly considered and made to contribute to the gratifying results. It is gratifying to note the interest that is being taken particularly in the increase of corn production in our State. A "corn show" gotten up by the publishers of the "National Stockman and Farmer" that was held at the State Capitol in the month of January excited very great interest. The exhibit was much larger than the most sanguine had reason to expect. An expert was present to judge the exhibits and award the prizes, who closed his work with a lecture on the subject of corn breeding and seed selection, using the exhibits as illustrations; and the appreciation of the whole affair was demonstrated by the lively bidding that was done when the prize winning corn was sold at auction.

In the cultivation of wheat, a few farmers are not content with less than forty bushels per acre, while others are satisfied with half that amount or even less.

Farmers are coming to understand that success does not always depend upon the soil and that the best soil does not in every case produce the best crop. While fertility is essential to success, there is no field of labor where intelligence and training will produce greater results than when applied to the operations carried on upon the farm.

POTATO GROWING.

While some sections of our State, particularly the limestone valleys, are noted especially for their production of cereal crops and livestock, it is proper to mention the adaptability of other sections to the production of potatoes, which may be counted as among the most valuable market crops produced by any section. Every potato grower understands that a matter of first importance in producing this crop is that the land shall be of such character that it can be kept in friable condition during the period of the crop's growth. With the heavy clay soils, this is a difficult thing to accomplish, so that soils that are well adapted to raising corn and other cereals are often likely to yield poor results when potatoes are planted. Nature has wisely provided that between the various kinds of soil there shall be a regular system of compensation. The planter of South Carolina or Florida would fail if he should attempt to grow rice upon the upland soils of these states, and so also would he fail if he should attempt to grow cotton upon the low marshes found in the same states. In our own State this natural law of compensation prevails, and the successful farmer must adapt his crop to his soil in order to succeed.

In many portions of the State, particularly in the counties of Clearfield, Lehigh and Bucks, unusually large crops of potatoes are being produced, which in some instances are bringing both wealth and notoriety to those engaged in potato farming. On inquiry it has been ascertained that at least some of these farmers had their attention turned to the value of the potato crop and the adaptability of their land to its production by lectures delivered upon the subject at the Farmers' Institutes conducted under the auspices of this Department. They have sought for and obtained the varieties most profitable and best adapted to the markets of our large eastern cities as well as the Pittsburg and other markets in the western section of this State, and by intelligent and careful cultivation they are receiving the reward they deserve.

A PROFITABLE YEAR FOR FARMERS.

The year was characterized by frequent changes of weather conditions, in the main unfavorable to crop production, and yet most crops did well. In some sections of the State the fruit crop was an entire failure, while in other sections there was from a fourth to a half crop, and in a few counties fruit of all kinds was plentiful. Corn grew well during the summer, but the early frosts prevented much of it from maturing promptly. Many farmers of the State have been unable to provide seed for next Spring's planting from their own growing and will be under the necessity of purchasing seed. Other cereal and vegetable crops produced an averaged yield, and the high prices at which all crops were marketed, brought to the farmers of the State a total income considerably in excess of the preceding year. On the whole, therefore, 1907 was a prosperous year for Pennsylvania farmers. The production of rye in Eastern Pennsylvania and on the shale soils found on the eastern slope of the Allegheny Mountains, while showing a very material increase in quantity, still enables Pennsylvania to hold her position as the leading rye producing district of the United States.

In comparing the yield of cereal crops of the State for 1907 with the yield of former years, it is gratifying to note that with the exception of corn, none fell below what may be regarded as an average crop both in yield and quality.

STAPLE FARM CROPS OF PENNSYLVANIA

The following tabulated statement of the staple crops of the State for 1907 shows that Pennsylvania continues to hold her place among the foremost states of the Union in point of agricultural resources, while in some of her products she leads all others.

STAPLE FARM CROPS OF PENNSYLVANIA, 1907.

CEREALS.

Commodity.	Total acreage.	Average yield per acre.	Total production—Bu.	Average farm price, Dec. 31, 1907.	Total farm value.
Barley,	9,000	25.5	230,000	.70	$161,000
Buckwheat,	257,000	18.0	4,626,000	.69	3,192,000
Corn (shelled),	1,413,000	32.5	45,922,000	.64	29,390,000
Oats	1,003,000	29.6	29,689,000	.54	16,032,000
Rye,	346,000	16.7	5,783,000	.75	4,337,000
Wheat,	1,618,000	18.6	30,095,000	.96	28,891,000
Total,					$82,003,000

HAY, POTATOES AND TOBACCO.

The hay crop represented 3,150,000 acres, the average yield being 1.45 tons per acre, or a total of 4,568,000 tons. At an estimated value of $15.75 per ton, this crop was worth $71,946,000.

Pennsylvania's acreage devoted to potato culture was 261,000, with an average yield of 88 bushels per acre, or a total of 22,968,000 bushels, standing second in point of production. The average price on December 1 was 67 cents a bushel or a total estimated value of $15,389,000.

The State produced 40,320,000 pounds of tobacco, grown upon 32,000 acres or an average of 1,260 pounds per acre. The aggregate value is unknown as the bulk of the crop is not sold or ready for the market. Its quality is high, and fair prices will prevail.

RESUME AND COMPARISON OF AGRICULTURAL STATISTICS.

A careful examination and comparison of agricultural statistics show that Pennsylvania again leads in the production of rye, a fact to which I have already referred, the total yield in 1907 being 5,783,000 bushels. Michigan ranks second with a total of 5,452,000 and Wisconsin comes third with a yield of 4,765,000 bushels. All the other states produce rye in limited amounts. California, contrary to the general opinion, is also a rye growing state with a yield of 1,251,000 bushels. The entire rye crop of New York reached but 2,119,000 bushels. Pennsylvania rye-flour brings the highest price in the markets, and as a result much of this grain raised in Pennsylvania is made into flour. There is also, always a good demand for Pennsylvania rye at the highest market prices by distillers who make what they call choice brands of strictly high grade rye whiskey their specialty; so that many thousands of bushels are shipped out of the State. The demand for rye straw and the high price at which it sells on account of its length and pliability, which make it especially valuable for packing purposes and bedding for animals, also adds to the importance of this valuable crop.

Pennsylvania's buckwheat crop in 1907 reached a total of 4,626,000 bushels, standing next to New York where the product amounted to 5,687,000 bushels. None of the other states grow much buckwheat, although some of them have the climate and the soil well suited to the production of this crop. The amount of buckwheat that can be produced upon an acre and the price it commands in the market, make it one of the most valuable cereal crops that can be raised on land adapted to its growth. The supply for good clean buckwheat is never equal to the demand which is constantly on the increase. The greater part of the buckwheat produced in the State is converted into flour by Pennsylvania mills. Much of this flour finds a market in our own State, and many tons of it are shipped annually to the large cities of the West and South, always bringing good returns. The middlings, which is a by-product obtained in the manufacture of the flour, is a very valuable article of feed. The high per cent. of proteids this feed contains makes it especially valuable as a feed for dairy cows and young animals.

While Pennsylvania always produces a large quantity of buckwheat, there are good reasons why the quantity should be much larger. The thin gravelly soil so frequently found upon the high altitudes of the State, when properly treated by the application of commercial fertilizers, seem to be just as well and even better adapted to the production of buckwheat than the richer soils found in the valleys where corn and wheat grow so luxuriously. It is also a recognized pecularity of the buckwheat crop, that it tames the wild land upon which it is grown and puts it in condition for raising the domestic grasses, where only mountain shrubs and brambles seem disposed to grow. The large areas of mountain lands in the State from which the timber has been cut, if they are to brought into subjection for agricultural purposes could, as a first step, be profitably employed in raising buckwheat and in this way the output of the crop could be greatly increased.

THE TOBACCO CROP.

The tobacco crop of Pennsylvania was of extra good quality and the general conditions attending its cultivation, housing and curing, were considered favorable. As a result of these favorable conditions, it is believed that the prices that the crop of 1907 will command, will exceed the figures paid for last year's crop. The series of experiments recently made in Lancaster county under the direction of the Pennsylvania experiment station have demonstrated that Pennsylavnia can produce a very superior quality of tobacco, and that with well directed efforts, it can be made one of the very best paying crops our farmers can raise. But few counties are doing anything in the way of raising tobacco; but there is no reason, except it be the question of farm help, why tobacco growing should not become more popular and receive the attention of farmers in many of the counties in which the subject has heretofore been given no thought.

DAIRY INTERESTS.

The dairying interests of the State are growing in importance and profit and our dairy products are said to exceed in value any of the cereal crops we produce. This growth is due to a number of causes. Increasing knowledge of the business, as well as modern implements and appliances for carrying it on, have had a beneficial effect. The organization of dairy associations whose members are by contact with each other stimulated to put forth every effort to produce better results has been very helpful. The instructions given at the dairy school connected with our State College have been of great service in producing better conditions throughout the State. The work of the State Dairy Union has been very helpful and deserves the highest commendation. This progressive movement should be continued and should receive the most liberal recognition. Like other operations upon the farm, this industry cannot be carried forward successfully without a considerable amount of farm help; but whether the business be conducted upon a large or a small scale, the practical dairyman has a sure and profitable source of income.

Attention has recently been turned by some of the dairymen of the State, to the manufacture or preparation of condensed milk. A condensing factory established in one of the northern counties of the State, is said to be yielding large returns to its patrons. This is a matter that it will pay our farmers to look into. The demand for condensed milk is constantly increasing. Every vessel that sails from an American harbor wants to take on board a large quantity of this important commodity. The increase of our army and navy is greatly increasing the demand for it, and farmers in sections well adapted to milk production, should not fail to inform themselves concerning this industry, which, although it is old, is comparatively new in Pennsylvania.

HAY CROP.

The amount of hay produced in our State in 1907 was considerably below that of the previous year. It is quite possible, however, that the aggregate value may have equaled or even surpassed that of the crop of 1906.

It is difficult to make even an approximate estimate of the value of our hay crop for any given year. owing to the different varieties and the diversified quality of the hay produced. Timothy and clover continue to hold first rank in importance among plants grown for hay. A few farmers are experimenting with alfalfa. a plant which thus far seems to be somewhat uncertain as to its adaption to the conditions prevalent in our State. Agricultural stations throughout the country are doing much to bring it into greater publicity and there can be no question as to its great value wherever it can be successfully grown. The large crops it is capable of producing, where conditions are favorable, together with its unusually high feeding value and its importance as an accumulator of nitrogen in the soil, make it well worth careful study and experimentation by the Pennsylvania farmer. If we can provide the conditions necessary to its successful growth, there can be no doubt concerning its becoming one of the richest and best paying crops produced upon the farms of the State.

FRUIT CULTURE.

It is gratifying to see the increased interest that has been taken in fruit growing during the last two or three years. Having noticed the tendency in this direction, a competent and practical fruit grower was employed by this Department to inquire into the local conditions of the various sections of the State and their adaptability to fruit production, to make such investigation as seemed necessary to determine the varieties best suited to the several districts of the State and to prepare a bulletin covering as well as possible, in the limited space that could be allotted to such bulletin, the entire subject of Fruit Growing in Pennsylvania. This bulletin was one of the Department publications for the year 1907. The demand for it was unprecedented, which shows the lively interest that is being taken in the subject of fruit growing by the farmers of the State. Although 15,000 copies were printed, it was thought for a while that we should be compelled to issue a second edition.

The work being done by the Pennsylvania State Horticultural Society is worthy of the highest commendation. This is an association of intelligent practical horticulturists, principally fruit growers, who meet regularly for the discussion of subjects bearing upon fruit growing and other branches of Horticulture; and the published journals of their proceedings add very much to the value of the agricultural literature of the State.

Fruit Growers Associations have been organized in a number of counties and all are performing excellent service for the fruit growing industry. One of the most active of these associations is located in Adams county, and in order to determine the value of certain materials, when applied as sprays for the extermination of insects and diseases destructive to fruits and fruit trees by farmers and orchardists who make no claim to being specialists in this line, as well as the cost of the same, an arrangement was made by this Department with said Association to conduct a series of experiments and to report results. The intention in the first place was to publish the report in full, as a bulletin of the Department, but later, the Association was asked to prepare a summary of the report, which appears elsewhere in this report, and which it is believed will prove very valuable to fruit growers generally.

The work that is being done by the Zoological Department to help the fruit growers of the State, speaks for itself. It is not only receiving the highest commendation of our local fruit growers, but it is attracting the attention of fruit growers all over the country.

MARKET GARDENING.

That Pennsylvania produces annually over $15,000,000 worth of vegetables, is a statement that will no doubt surprise many who may read this report. But one state in the Union exceeds this amount. The large scale upon which market gardening is carried on in this State is owing to the splendid home market we have for everything the truck grower produces.

Much as we are doing in this line, there are still reasons why this industry should be encouraged and why more should be done. With the large acreage of land we have that is peculiarly adapted to truck farming and the transportation facilities we possess, there is no reason why we should be dependent upon other states for vegetable products other than such as are received from the South in the early spring, before our own products are ready for the market. It is nevertheless true that hundreds of carloads are shipped into Pennsylvania every year from New Jersey, Ohio and other bordering states.

The Department of Agriculture has at various times issued special bulletins relating to Market Gardening and Truck Farming, which have proved quite helpful to those engaged in the business, and which to our certain knowledge have been instrumental in turning the attention of others to this profitable branch of farm industry.

The demand for such products is still on the increase, and with the undeniable evidence before us that truck farming properly conducted, pays several fold more than raising the ordinary farm crops. the wonder is, that there should not be more interest taken in scientific market gardening.

Our State College has recognized the importance of this industry and has provided a special course of training for young men who expect to engage in it. A large part of the instruction is given in the field where the work is done and where every scientific principle involved can be more fully and satisfactorily explained than is possible in the class room.

POULTRY.

Pennsylvania holds a high rank among the leading states in the production of eggs and poultry.

The publications issued by the National and State Departments of Agriculture, relating to poultry husbandry, are in great demand. The constant presence of the lead pencil and vest pocket note book that every institute lecturer has for years been insisting that the farmer must always have with him, has, in recent years, induced many farmers and farmers' wives to keep records of what it costs to keep their flocks, and the returns they are receiving, and results have proved so encouraging as to induce many of them to prepare for keeping larger flocks and to enter upon poultry culture on a much larger scale than had been customary.

It has been but a few years since the flocks of poultry on the average farm were quite small, and farmers had doubts as to whether there was any profit in what were kept. At the present time it is not uncommon to find farms on which several hundred fowls of the different varieties are kept and in every instance where they are given proper attention and care, they are found to be a profitable source of income.

In the poultry business as in other branches of farming, there are those who are after the largest profits which they manage to secure by selling pure bred stock and eggs, but the majority depend entirely upon the ordinary poultry and egg market which is usually found quite satisfactory.

Most poultry raisers have come to understand the disadvantage of in-breeding and raising "scrub-stock," so that quite as much pains is taken to secure pure blood of whatever variety may be in greatest favor and to keep the breeding up to the proper standard by the introduction of new blood as is taken with any of the other live stock upon the farm.

FARM ANIMALS.

The National Department of Agriculture has just issued a statement of the number, average and total value of farm animals in the country, from which the following statement relating to Pennsylvania is taken. The statement shows that in 1907 the figures were as follows:

Animals.	Number.	Average value per head.	Total value.
Horses,	607,000	$114 00	$69,198,000
Mules,	41,000	124 00	5,084,000
Milch cows,	1,152,000	36 00	41,472,000
Other cattle,	965,000	18 00	17,370,000
Sheep,	1,102,000	4 62	5,091,000
Swine,	990,000	7 80	7,722,000
Total value,			$145,937,000

While the above estimated value is surprisingly large, it is quite probable that the actual worth of all horses, mules, cattle, sheep and swine is rather under-estimated than over-estimated.

Our State does not produce anything like the amount of live stock needed to meet the requirements of our population. Many horses, mules and cattle are brought into Pennsylvania from the West and South every year. Large numbers of sheep and swine also are brought from the West.

There has been, during the last few years, quite a revival of interest in the subject of stock breeding, and in recognition of this interest and to meet, in some measure, the wants resulting from it, this Department arranged for the preparation of bulletins of information upon the subjects of breeding and care of sheep, cattle and horses. The bulletin relating to sheep was issued in 1906.

It seems difficult to secure the services of competent persons to prepare the matter for the bulletins relating to the cattle and horse breeding industries, but parties in whom we have full confidence have finally been secured for this work, and although these bulletins have been delayed longer than we had supposed would be necessary, we expect confidently to be able to place them in the hands of the State Printer early in the coming year.

The State Livestock Breeders' Association is doing much to encourage the breeding of more live stock in Pennsylvania. Prominent stock breeders from other states are secured to deliver lectures at their meetings, and the information contained in these lectures are given to the public by printing such addresses with the proceedings of such meetings, which are sent broadcast to do missionary work throughout the State.

The act passed by the General Assembly of 1907, entitled "An act to encourage the breeding of horses," etc., will no doubt lead to the breeding of a better class of horses in our State, an improvement which is very much needed and which will stimulate our best breeders to greater energy in their calling. When it becomes generally known that horses bred in Pennsylvania are free from hereditary tendencies to unsoundness, and that with proper care, no blemish is likely to develop during the period of a horse's active life, buyers will seek for Pennsylvania stock, and better prices, as a consequence, will prevail.

A great number of cattle are fed in Pennsylvania for the butcher's market every year, most of which are brought from other states. During the year 1907, 80,000 head of cattle were sold for feeding purposes from the stock yards at Lancaster City, alone, and from the same yards 60,000 head were sold for slaughter.

The unfavorable season for properly maturing the corn crop, which has already been referred to, served as a hindrance to the profitable feeding and fattening of stock. The thrifty Pennsylvania feeder, not willing that his reputation should suffer, in many instances, made up the loss occasioned by immature corn, by purchasing western mill feeds and good Pennsylvania steers were, as usual, found in the market, demanding remunerative prices.

CHESTNUT CULTURE.

In 1904, this Department issued a bulletin on Chestnut Culture, prepared by Mr. C. K. Sober, of Lewisburg, Pa. Before arrangements were made for the preparation of the bulletin, Mr. Sober's farm was visited and a careful calculation was made of the possible outcome of the work that was being done at the time of the visit. Nothing seemed clearer than that a great field of profit was open to persons possessing mountain lands, from which the chestnut timber had been recently removed, or was soon to be removed, and the bulletin was issued.

It was found on the visit referred to, that Mr. Sober then had between 75,000 and 100,000 young and thrifty chestnut sprouts grafted with Paragon chestnuts, many of which were beginning to bear fruit. Some of the grafts that were from two to three years old, were producing from three to four quarts of chestnuts, while older grafts were bearing proportionately well. Last year Mr. Sober had orders for many hundreds of bushels of chestnuts, at $6.00 per bushel, over and above what he was able to fill.

This experiment proves conclusively that chestnut land, from which the timber has been removed, is susceptible of being turned to great profit by grafting the sprouts with the improved Paragon variety, and the matter is referred to in this report, not to give prominence to what an individual citizen has accomplished, but rather to point out what may be done by others to reclaim and put to profitable use, lands that may otherwise be allowed to lie waste.

Mr. Sober's home is at Lewisburg, Pa., and the chestnut farm is near Paxinos station east of Sunbury of the Penna. R. R. where anyone wishing to do so, can see what has been accomplished.

COMMERCIAL FERTILIZERS.

An important part of the work of this Department is the control it exercises over the sale of commercial fertilizers. The good that is accomplished every year in this one line, more than compensates for the entire cost of maintaining the department. The farmer, who to-day purchases a fertilizer intelligently, needs not fear that he is not receiving a fair equivalent for his money.

Twice each year agents of the Department are sent out over the State to collect samples of the fertilizers that may be found upon the market, which samples are analyzed by competent chemists, and the results of analysis, together with a statement of the actual commercial value of the goods, are published in a bulletin and given to the public. It was hoped, when this work began, that such publication of the character and actual value of fertilizers in use, would prove a sufficient means of keeping the goods up to the standard of the guarantee every manufacturer is required to give, but it has been found necessary to bring some prosecutions for the violation of the fertilizer law.

Prosecutions thus far have been brought only in cases where the discrepancy between the analysis and guarantee was so great as to indicate a clear intention to defraud, for the reason that with the means at our disposal, it was impossible to employ the assistants needed to make information against offenders, and to attend the hearings before magistrates and trials in quarter sessions courts, as well as to pay the counsel fee that would follow if prosecutions were instituted in every case in which an action might be sustained. With the more liberal provision made by the last General Assembly, we have been enabled to increase our force sufficiently to render it possible for the Department to draw the lines more closely, which will be done during the year upon which we have just entered.

The Department is constantly receiving inquiries regarding the legal right of farmers to mix raw fertilizing materials for their own use. Owing to the satisfactory results of experimenting conducted by some farmers and truck growers, the use of special formulas for fertilizers is becoming quite common, and manufacturers, in some instances, insist that they should be permitted to sell raw materials such as dried blood, tankage, nitrate of soda and potash, without complying with the act of Assembly, requiring a statement of the percentage of fertilizer ingredients they contain, or the payment of the regular license fee. It is true that farmers should be able to buy these materials to better advantage if the license fee were not required, but if persons selling such raw materials should be exempt from the requirements of the act regulating the sale of fertilizers, the purchaser could have no assurance that he receives what he pays for; unless he buys upon a guarantee, in which case, each farmer would be at the expense of getting the goods analyzed or his guarantee would avail him nothing. It is better, therefore, that the manufacturer furnish the guaranteed analysis with every package sold and pay the regular license fee. This is what the law requires shall be done in the case of every substance sold within the Commonwealth, for manurial purposes, except barnyard manure, wood ashes, marl and lime.

In response to the expressed wishes of many of the farmers of the State, an attempt was made during the last session of the General Assembly, to secure an amendment to the fertilizer law, so that it shall provide that the statement to be attached to every package sold, shall not only show the percentage of phosporic acid, potash and nitrogen the goods contain, but the sources also from which these ingredients are derived. Some of the elements used in compounding fertilizers dissolve much more promptly than others, and a quick growing crop will be benefitted much more by a fertilizer made up of materials that dissolve readily than one that requires a longer period for becoming available. For this reason, it is very important that the farmer should know what he is applying to his soil.

The bill to amend passed the House of Representatives without opposition or delay, but it did not fare so well when it reached the Senate. It remained in committee for an unusually long period and after two hearings were given by the committee to parties wishing to be heard, it was referred to a second and different committee, from which its friends were unable to secure a report.

An important service will be performed for the farmers of the State, if such a measure is passed at the next meeting of the Legislature.

FEEDING STUFFS.

The act of Assembly regulating the manufacture and sale of feeding stuffs has produced results that should be very gratifying to those responsible for its passage. Many feeds of little value that were being sold at comparatively high prices have been driven from the markets of the State. We are glad to note that only a very small per cent. of the low grade and adulterated feeds sampled by the agents of the Department were the products of Pennsylvania manufacturers.

During the year, five hundred and sixty samples were drawn and four hundred and ninety-eight were analyzed at the laboratory of the Department. A careful examination of the Annual Feeding Stuffs Bulletin, will show that there is a greater equality between the actual value of the feeds upon which report is made, than in former years.

The act of May 28, 1907, commonly known as the "New Feeding Stuffs Law," has completely cleared our markets of what is known as Condimental Feeds. A very large amount of correspondence between manufacturers of such feeds and the Department was necessary before the former could be induced to give up the practice of selling "stock powders" as "stock foods" with high sounding adjuncts, and descriptive phrases, claiming for such foods great feeding value. The Department was insistent upon strict compliance with the law, and manufacturers of such commodities were given a reasonable time to get their products off the market or change their labelling, so that no feeding value should be claimed and the goods be sold under a name that could not mislead the purchaser, and we are glad to be able to record the fact that so far as we can learn, the change has been made without the necessity of bringing any prosecutions.

The number of prosecutions brought during the year for violations of the feeding stuffs law, were forty-seven, and the amount paid in fines and covered into the State Treasury was $965.00. Of the prosecutions brought during the year, twelve remain undetermined. In a few instances, in which, after obtaining full information concerning all the circumstances attending the case, we had doubts as to whether the action could be sustained, settlement before the magistrate or court was permitted upon the payment of costs by defendants. In only two cases, the costs were paid by the Department.

LINSEED OIL AND MIXED PAINTS.

The examination of the linseed oil upon the markets of the State was continued during the year. The examination of oil made the previous year showed that the oil sold in Pennsylvania, was of better quality than was generally supposed, and the investigations made during 1907 proved still more satisfactory. The work done in 1906 show that boiled oil is much more likely to be adulterated than the raw oil. Another thing brought out by the examinations was, that the adulterated oils were not the product of Pennsylvania manufactories, but were imported from other states.

The few prosecutions that were brought seemed to have a salutary effect. One brand of oil that was being sold in the western part of the State was entirely driven from the market.

The small amount of money appropriated annually by the State in providing for the examination of oils, is well expended. A very large amount of money is expended every year by the property owners of the State in keeping their buildings painted, and it is very gratifying to them to be able to have some assurance that the materials they are using, are not adulterated.

The adulteration of linseed oil nearly always consist in the addition of benzine or mineral oils, which can usually be detected by anyone accustomed to handling it, by means of the odor and taste. The appearance of the oil also to one accustomed to using or handling it, is a pretty safe indication of its quality. Oil that is adulterated by the addition of mineral oils, is likely to show surface colorings that are different from the main body of the oil. Other adulterants are rosin oil, low grades of fish oil and the lower priced vegetable oils, such as corn and cottonseed oils. Much the larger per cent. of adulteration was found in boiled oil, so that in its purchase, it is necessary to be especially careful to secure an article that is pure.

In an article contributed to the "Chemical Engineer" by Prof. Henry M. Loomis, who for two years, made the chemical examination of oil for this Department, Mr. Loomis, in speaking of the tests for determining the purity of linseed oil, gives the following directions:

"(1) Appearance. The oil should be clear and deposit very little, if any, sediment on standing, but pure boiled oils are sometimes slightly turbid. Mineral oils are decidedly fluorescent and I found several cases in which mineral oil could be detected in linseed oil by this property alone, but often the mineral oil used for adulterating is treated so as to destroy the fluorescence, or "bloom," as it is commonly called. Boiled oil should not be so thick as to require thinning with turpentine, nor should it be too dark colored.

"(2) Odor. Mineral oil, benzine, rosin oil or fish oil can generally be detected by the odor, especially upon heating a small quantity of the sample either by rubbing it vigorously between the hands for a few seconds, or warming over a lamp or candle flame in a small vessel.

"(3) Drying Test. The oil is spread in very thin layers on a glass plate and maintained at a fairly uniform temperature of about 60 degrees to 70 degrees. Boiled oil should be dry completely in at least 40 hours and raw oils in 72 hours. The dry film should be tough and elastic when peeled. This test serves best as a comparative one on several samples, and should be tried in clear weather as far as possible, but the plates should not be exposed to direct sunlight."

A great deal of complaint is made concerning the character of mixed paints and varnishes, sold in the State. Other states seem to have the same trouble and in some, laws have been enacted providing for their examination and prescribing the properties they shall possess. A few states also have laws regulating the sale of turpentine and providing for its purity.

The subject of paints, varnishes and turpentine is of sufficient importance to be taken up by our General Assembly, with a view to providing some measures by which the quality of these commodities sold in Pennsylvania, may be improved. A bill of this character was before the Legislature at its last session, but failed to become a law.

AGRICULTURAL FAIRS.

The report of the Deputy Secretary states that in 1906 the aggregate attendance at county fairs reached 1,829,389. It is further stated that these fairs show that there was a gain over the previous year of 854,289, or almost double the attendance for 1905.

The amount paid out in premiums was $99,603.82 as against $116,039.32 paid out in 1905. The premium lists issued by the societies holding fairs offer for 1907 the liberal sum of $159,145, an increase of $16,489.50 in 1905.

There are a number of Agricultural Societies or Associations in the State that do not hold fairs, which devote their funds and energies to other educational work of great value, whose influence for good is recognized by this Department, and with whom we are always glad to co-operate. The meetings of some of these associations attract some of the best public teachers of Agricultural Science in the entire country and, therefore, deserve all the recognition and assistance this department is able to give.

The continued agitation by the public press, of the subject of suppressing all immoral and objectionable features, that seemed to be obtaining an established position in some of the fairs held in the State, has not been in vain and conditions have been greatly improved. While our State recognizes the very great good that can be accomplished in behalf of Agriculture, by well conducted county fairs, it cannot afford to make any appropriation of public money in any direction or for any purpose where just criticism or adverse comment can be sustained.

The reports received by the Department show that the fairs of 1907 were among the most successful, in point of interest and attendance, in the history of the State, and that the exhibits were superior both in number and quality. The management, in most cases, refused to grant the customary "side-show" privileges that formerly aroused the just criticism of the public and the better class of people generally.

A ban is upon all classes of gambling or betting and the moral atmosphere of county fairs generally is greatly improved. Persons who predicted a large falling off in attendance, if the objectionable features were prohibited, were proved to be in error, since the complete reports received show that the season of 1907, was as already stated, one of the most successful in point of attendance that our people have ever enjoyed.

To the good people of the State, it is a matter of self congratulation that a better era for county fairs has dawned. As a source of education, the county and State fair should receive the loyal support of farmers, always and everywhere, but as a place for immoral exhibits and petty gambling, they are not worthy of their support.

The General Assembly of 1907 passed an act authorizing County Commissioners, for the purpose of encouraging agriculture, to pay annually $1,000 to any incorporated Agricultural Association within their respective counties, that pays premiums on agricultural exhibits. The act provides, that this amount shall be paid to the societies holding such exhibition, for a period of not less than four days, in the interest of stock raising, handiwork and farm production, generally. The money thus provided cannot be devoted to the payment of premiums for exhibitions of speed or any manner of horse racing. The act also prohibits gambling devices or gambling in any form, upon the premises of the Association claiming such money, and also provides that the Association claiming such money shall pay in premiums a sum equal to the said $1,000, and when two Associations in the same county claim and receive five hundred dollars each, they shall each pay a like sum in premiums, and that all premiums shall be paid only upon the products of the county wherein such exhibition is held. Under the liberal provisions of this act, some of the smaller and less prosperous agricultural societies of the State have been stimulated to greater efforts, and are in position to do much for the agricultural interests of their counties.

It cannot be regarded otherwise than as a great misfortune that the bill that was before the Legislature of 1907, providing for the establishment of a State Fair, did not become a law. It is confidently hoped that the matter will be again taken up by the next Legislature and that success may crown the efforts of the progressive farmers who were so earnest in their pleas for such legislation a year ago.

FOUL SEEDS.

Many inquiries come to this Department concerning methods for the destruction of weeds, and many specimens of weeds are sent to us for identification, which proves that every one whose duties require much travel knows to be the case, that foul weeds are becoming quite prevalent in our State. This condition is the result of sowing seeds that are impure, particularly, clover and grass seeds. It is doubtful whether up to a period of ten or fifteen years ago, a stalk of either wild mustard or dodder could be found anywhere in the State. Now, both these plants are becoming quite common. The former no doubt has been introduced by sowing oats and barley seed, obtained from the West, in some parts of which this weed abounds. The latter is more likely to have been brought into our State with clover or grass seed. Many other weeds not native to our State have been introduced in the same manner.

There are few greater hindrances to crop production than this soil pollution, and the struggle the farmer has upon his hands to rid his fields of these pests when they have once gotten a fixed hold, is both annoying and expensive.

In addition to the introduction of foul weeds in the way suggested, much of the clover and grass seed brought into this State, and possibly some that is produced in the State, is adulterated by having mixed with it low grade and infertile seeds imported solely for the purpose of such adulteration.

The propriety of some legislation to correct this evil may be worthy of the consideration of the law makers of the Commonwealth.

FARM HELP.

The information gathered by this Department, in relation to farm wages, shows that covering a period of several years, there has been but very little changes.

The average amount paid to farm hands employed by the year, with board, is $220.00.

For summer months only, with board, ...	$22.50	per mo.
For entire year, without board, ...	315.00	
For harvest work, by the day, with board, ..	1.75	
Irregular work, by the day, with board, ...	1.10	
Female household help, per week, ...	2.75	

While some of these figures may not appear attractive to wage earners, when compared with wages paid to miners and factory hands, the farm laborers enjoy certain privileges and perquisites that count for much, and at the end of the year, he is likely to have laid by for future use, from what to him may seem scant wages, more than the man who is employed in either factory or mine.

The solution of the complex farm help problem remains unsolved, and as long as the unusually prosperous times for all manufacturing industries continue, farm help will be scare at any price the farmer can afford to pay. Whenever a period of financial depression comes, and men employed in other industries are put upon short time or "laid off" entirely, the labor of the country naturally seeks relief by going "back to the land" where the Creator first placed it and directed the Garden to be dressed and kept.

It is unpleasant to record the fact that during the year, there were some instances where the owners of good farms gave up all farm operations on account of the serious trouble experienced in securing suitable help.

The farmer cannot succeed with the indifferent help that may prove satisfactory in other industries. All the operations of the farm require good management and skillful execution. It requires infinitely more skill to run a corn planter or to dray with listing plow a straight furrow in which the corn may be dropped by hand, than is needed to drive a spike in a railroad tie or pull a rod of iron through the rolls. For this reason, the class of foreigners, usually employed as laborers, will not meet the pressing need.

In some sections of the country, the experiment was tried, but with rare exceptions, none but immigrants from Northwestern Europe where farming is intelligently practiced, were able to render satisfactory service, And, unfortunately for Pennsylvania, such immigrants all come to America with their destination fixed for some point in the Middle West or Northwest of our own country.

This very economic question is receiving the careful attention of both National and State officials, and it is to be hoped that some measure of relief may be worked out in the near future.

FORESTRY AND AGRICULTURE.

The farmers of Pennsylvania have a deep interest in the conservation of the forests of the State. This interest was recognized by the General Assembly when the act creating the Department of Agriculture was passed, and as the result of this recognition, a Commissioner of Forestry was named as one of the officers of the Department.

With the increased public interest manifested in forestry, it was found necessary to create a separate Department of Forestry, in order to best promote such interest and carry forward the work so important to all the people of the Commonwealth. The creation of the new department, however, has not in the least degree diminished the interest that all farmers should take in the subject. The effect that large bodies of standing timber has upon the climatic conditions of the adjacent country, is too well understood to require any discussion.

No public money was ever expended to better advantage than the limited amount that has thus far been paid for the purchase of mountain lands, not suited to agriculture, upon which the timber, found at the time of purchase, is being scrupulously preserved and cared for, and where young forest trees suited to the locality and other conditions of these lands are being planted, so that it will be a matter of only a comparatively few years until these lands will again be covered with forest trees.

Reference is made to this matter in this report for the purpose of calling the attention of farmers to its importance, and in the hope that wherever they may be able to do so, without decided pecuniary loss, they may spare the forest trees growing upon their own lands and if possible be induced to take an active interest in the general observance of Arbor Day, the day set apart annually by the proclamation of the Chief Executive of the Commonwealth for planting trees.

The custom of planting trees on Arbor Day should be established and observed in every community and by every land owner who has room upon which such trees can grow. With the present wholesale destruction of timber, not only in our own State, but throughout the entire country, the question of forest conservation is more important than the unthinking, whose attention is not called to it, are likely to suppose. No greater evil can befall any people than that which comes from the destruction of their forests, and it is the duty of every one, whether in public or private life, who sees the danger confronting us to join in raising a note of warning before it is too late.

The Farmers' Institute work under the efficient supervision of the Deputy Secretary of the Department, was successfully conducted through the institute season of the year. The interest in this work continues to increase. The Director, being himself a practical farmer, is able, by acquainting himself with changing conditions, to organize each year, a lecture force that is able to meet the requirements of the time. From every section of the State, reports come of the great good this educational agency is accomplishing.

The work of the Veterinary Division is increasing every year. The help afforded to the work of this Division by the creation of the office of Deputy State Veterinarian, was very much needed and results have proved the wisdom of the General Assembly in affording this relief.

The Bureau of Zoology has achieved gratifying results during the year. What with the original research and investigation work placed upon this Bureau, by the last General Assembly, and the continuation of the demonstration work which has been growing in importance and interest, the Chief of the Bureau has had his hands full and the wisdom of the Legislature in providing the means for increasing the force of the Division, is clearly seen.

The Dairy and Food Bureau has continued its activity during the year, and the very full report of the Commissioner contained in this general report, possesses exceptional value and interest. The work for pure food and pure dairy products for Pennsylvania has been kept well to the front. A searching test of the new food law, passed by the Legislature of 1907, has been made and the Commissioner's report calls attention to some important changes needed.

The oleomargarine and renovated butter laws of 1891, which still remain upon the statute books of the State, have been vigorously enforced, and the aggregate amount of oleomargarine license fees and fines paid into the State Treasury in 1907, for the use of the Commonwealth, is larger than ever before.

Brief reference has been made to the specific work of the several Divisions of the Department, for the reason that a full report of the work of each Division will be found in its proper place in this volume.

AGRICULTURAL EDUCATION.

Before closing this report, I wish again and more specifically to refer to the importance of better training for the coming occupants and operators of Pennsylvania farms, and the greatly improved advantages of the times in which we live, for securing such training.

The act of Congress establishing colleges for the promotion of agriculture and the mechanic arts was passed in a day when there was little science that had a known relation to the art of agriculture. Our land grant colleges failed in the early part of their history to commend themselves to most practical farmers. Twenty-five years after their establishment, our experiment stations were organized. Then came a search for facts bearing upon agriculture, but for years there was a dearth of scientists who could prosecute the work effectively.

It is only within the last ten years that we have made rapid progress in the creation of a science vitally affecting the art of agriculture. The colleges and stations manned by scientists and equipped with funds have made notable discoveries and progressive farmers everywhere have learned to go to them for guidance. The day is passing when a land owner can obtain good income from the soil without the employment of much knowledge that has come from college and station investigation. Land and animals give satisfactory returns only in the degree that they are handled in accordance with the new science. A public awakening to this fact has created an immense demand for men trained in scientific agriculture. They are wanted in the management of estates, in the work of colleges and stations, in the broad field covered by the national department of agriculture, in the scientific work of state departments of agriculture and in secondary school instruction. Agricultural education is sought to-day not only by men wishing to prepare for scientific positions but also by a large number of young men who want to increase their earning power upon their own farms. While salaries connected with agricultural positions are relatively high, on account of the limited supply of scientists and the immense demand, the opportunities open to the individual land owner are great when he is prepared to use the most scientific methods.

It is a pleasure to record the notable expansion of the work in the School of Agriculture and Experiment Station of the Pennsylvania State College in the past year. The reorganization of this institution under Dean Thomas F. Hunt has been attended by the addition of twenty men to the faculty. The facilities for experimentation have been enlarged by the purchase of more land and animals, and research work of great value is under way. The completion of the new agricultural buildings affords choice facilities for instruction. I am informed that fifty freshmen have enrolled this year in the regular four years' courses.

While the Pennsylvania School of Agriculture is training scientists, it offers its services to the men who want to become farmers. A special course of two years is provided for men who do not have the time for the school preparation for a regular four years' course, and its purpose is to equip men for practical work in the field, orchard and barn. No entrance examinations are required and this two years' course is attracting many students. The winter courses in agriculture covering twelve weeks, form an attractive feature of the instruction offered. Ninety young men went to the college last winter for three courses and the instruction was designed to increase the earning power of each one. It was my privilege to meet this class last winter, and I was impressed with the intelligence of these young men and their eagerness in the pursuit of knowledge.

The avowed policy of the State's School of Agriculture to serve the land owners of the State is securing the loyal support of our farmers, and I am glad that as the head of the State Department of Agriculture, I can, with confidence, assure the young men of our

State who wish to qualify themselves for the kind of service that the new era in agriculture demands, that our own Agricultural College is now fully equipped for its work and that they will make no mistake if they place themselves under the training of her competent instructors.

In concluding this report, I desire to say, that in reviewing the work of the year just closed, I am impressed with the thought that each Division of the Department has broadened its work and increased its efforts to render efficient service to the Commonwealth. There is an increasing interest in Scientific Agriculture all over the State. The subject is receiving more attention in our public schools than ever before and every indication points to higher attainments yet to be achieved.

I wish to take this opportunity to thank you personally for the wise counsel and earnest support you have always been ready to give me in my official work, and to express also my very high appreciation of the courteous treatment and efficient aid the Department has uniformly received from the agricultural and public press of the State.

I have the honor to be,

Very faithfully yours,

N. B. Critchfield

Secretary of Agriculture.

THIRTEENTH ANNUAL REPORT OF THE DIVISION OF FARMERS' INSTITUTES FOR THE SEASON OF 1906-7.

Harrisburg, Pa., *Jan. 1, 1908.*

To the Honorable N. B. Critchfield, *Secretary of Agriculture:*

Sir.—I have the honor to present herewith the Thirteenth Annual Report of the Division of Farmers' Institutes.

In presenting this brief report of institute work for the past year, we find the field constantly expanding, the interest on the part of the farmer deeper and more intense. This conclusion is not arrived at alone from the vast numbers that attend the meetings, but also from the deep interest manifested on the part of the audiences, who ask questions of the instructors and join in the discussion of problems confronting them in their farm operations. Were it possible to present in this report a panoramic view of the progress made by the Pennsylvania Farmer within the past decade (largely as a result of teachings at the Farmers' Institutes) the picture would be more striking than words can demonstrate. On every side we see the old-hap-hazard methods, that formerly answered the purpose, abandoned and in their stead installed modern and approved methods. This statement is evidenced most emphatically in the discarding of old and out-of date machinery and purchasing the improved, which by the scarcity and high wage scale performs so important a part in all farm work. The careful cultivation of the seed bed for all crops. The growing of the various leguminous plants, most valuable not only for animal feeds, but also for enriching the soil. In Animal Husbandry whatever be its distinctive line, we find the stock bred and fed for a special purpose; if it be the dairy cow, she bears the dairy type and her feed is of the quality intended to stimulate milk production. The old substantial high walled but dark Pennsylvania barn is being remodeled, properly lighted and ventilated, and new barns, when erected, more fully conform to all the sanitary requirements so essential to the health of the animal and purity of her product. Sheep Husbandry is at present on the increase, greater attention is given to selection of flocks for special purposes, the growing of early lambs for market is an inviting field for persons located near the larger cities. In other portions of the State the Delaines and other wool producing breeds are measurably profitable. Perhaps the greatest enemy of this important line of animal industry is the dogs. We earnestly urge upon the Legislature the necessity for more stringent laws restraining all dogs from running at large, when not in charge of their owners. It ill becomes a State so well adapted to sheep husbandry to permit so great an industry to be driven out because of being overrun by a pack of worthless dogs.

Possibly in no direction had greater advancement been made than in the manner of handling poultry; the old dung-hill flock has been replaced by the thoroughbred, of some one of the leading breeds, the well equipped house has superseded the old cherry-tree, as a roosting place, carefully prepared rations are regularly given results obtained are the most satisfactory, demonstrating that for money invested greater profits are obtained than from either horses, cows, swine or sheep. From reasonably accurate reports during the past year eggs to the value of $15,000,000 were produced.

So earnest have the farmers become in learning the best manner of growing fruit, especially the apple for the growth of which Pennsylvania is better adapted than most states of the Union, our institutes are teaching how to plant, cultivate, prune and spray, also the varieties suited to the different soils, altitudes and climatic conditions. Under intelligent direction our State is destined to pass from the second to the first rank in Fruit Growing.

Through the agency of the Farmers' Institute the farmer is rapidly learning how shamefully he has for the past century treated "Mother Earth," taking from her year after year the crops she bore and giving back nothing in return until she became unproductive. He now studies the soil he cultivates, knowing full well that properly handled it becomes an active moving, living force, inhabited by insect creatures and bacterial agencies working day and night, summer and winter for his best interests. Yes, the farmer now knows that his occupation is joined to the great natural forces that move the world and as he works in harmony with these forces will he succeed to the highest degree.

Realizing that the farmer of to-day, if he would accomplish the full measure of his mission, should of necessity have access to a more complete educational equipment for his life's work. With this object in view we have held one session of the institute devoted to Educational Questions, urging more thorough equipment of our Country Schools, thus opening the way for the teaching therein to the farmers' children at least the primary principles of agriculture. By so doing we could open up to the young minds many lessons that would better fit them for their life-work, whether engaged in agriculture or some other occupation or profession.

Pennsylvanians have reason to be proud of their farm homes, comfortable farm houses, large and substantial barns. The great inventor, Thomas J. Edison, is reported to have said that after traveling across the United States in his automobile, "Pennsylvania had the best farm houses and largest barns of any state in the Union;" for this condition we all feel a laudable pride, recognizing the importance of farm homes of the State and how closely they are associated with her commercial and moral upbuilding. We have usually devoted one session of the institute in considering the interests of the home, its location, sanitary surroundings, social life on the farm, also the moral bearing of the home life and its relations to the State. This is usually known as the "Women's Session," having for its presiding officer, a lady of standing in the community where the institute is held. Indeed many of the Country Home Sessions are conducted entirely by the ladies, their work accomplished for the betterment of the farm homes of Pennsylvania can not be over estimated.

Actual work of Institutes began Dec. 3rd, 1906, and continued throughout the winter finishing March 9th, 1907. We held in all 392 days of Institutes at a cost of $37.50 per day and challenge competition. This cost, embraced hall rent, printing programs, local expenses of County Managers, traveling and per diem pay of State Lecturers, three of whom attended all meetings. In addition there was held our Annual Normal Farmers' Institute at Allentown June 4-7, where assembled the entire institute force both Lecturers and County Managers. These meetings have proved to be a real uplift to agriculture. Here the entire year's work is canvassed, plans for future work is mapped out, instruction given by persons qualified to speak on the various subjects to which they are assigned. Program of this meeting is inserted herewith.

I should further add that the attendance at the past year's institutes was 146,915. Added to this the Division supplied one or more speakers to take part at Farmers' Home Meetings, Club Meetings, etc., the attendance at which is reported at 15,000 making a grand total of 161,915. There were 56 lecturers who were engaged to give instruction at these meetings, 342 local people took active part on the program, joining with the State force in the work. During the year we held a modified Dairy School at Troy, Bradford county, Pa., at the creamery located there, patrons of the creamery with others becoming members of the class—Prof. H. E. Van Norman and Mr. L. W. Lighty took up the class work of milk testing, butter making and scoring. A dairy barn in the neighborhood was visited and points of the dairy cow and ventilation were discussed. Much interest in this order of work was manifested. Other places are asking for schools of like character.

Much commendation is due to local speakers who took active part at Farmers' Institutes the past season. A limited number of the papers there read have been published in bulletin form and commend the writers of said papers, not only for their active interest in building up agriculture in their various communities, but demonstrates the high ideals entertained for rural and farm life.

A more complete knowledge of the institutes can be obtained from the following program and schedule giving in detail the entire work of the season:

MEETING OF FARMERS' ANNUAL NORMAL INSTITUTE.

PROGRAM.

First session convenes Tuesday Evening, June 4, 1907.

MR. P. S. FENSTERMAKER, Allentown, Pa., Chairman.

Call to order 7.30.

Address of Welcome by Hon. M. C. L. Kline, Allentown, Pa. Voluntary responses by Members of Institute.

1. "THE WASTE AND SAVING OF THE WATER IN THE SOIL." (Illustrated by charts.) (40 minutes, and 20 minutes for questions.)

Mr. H. B. Hilton, Port Allegany, Pa.

Wednesday Morning, June 5, 1907.

HON. WM. F. BECK, Nazareth, Pa., Chairman.

Call to order 9.00.

1. "NATURAL AGENCIES IN SOIL IMPROVEMENT." (40 minutes, and 20 minutes for questions.)

Prof. E. B. Voorhees, Director New Jersey Agricultural Experiment Station, New Brunswick, N. J.

2. "WHAT THE CHEMIST HAS FOUND IN PENNSYLVANIA SOILS AND THE RELATION OF CHEMISTRY TO AGRICULTURE." (40 minutes, and 20 minutes for questions.)

Dr. Wm. Frear, Chemist, Dept. of Agriculture Experiment Station, State College, Pa.

3. "WHERE CROP YIELDS ARE LIMITED BY LACK OF PHOSPHORIC ACID AND OF LIME IN THE SOIL." (40 minutes, and 20 minutes for questions.)

Mr. Alva Agee, Wooster, Ohio.

Wednesday Afternoon, June 5, 1907.

MR. JOEL A. HERR, Millhall, Pa., Chairman.

Call to order 1.30.

1. "MODERN TREATMENT OF THE APPLE ORCHARD." (40 minutes, and 30 minutes for questions.)

Prof. Geo. C. Butz, State College, Pa.

2. "THE PEACH; HOW TO RAISE AND MARKET." (40 minutes, and 20 minutes for questions.)

Dr. J. H. Funk, Boyertown, Pa.

Wednesday Evening, June 5, 1907.

MR. A. P. YOUNG, Millville, Pa., Chairman.

Call to order 7.30.

1. "SOCIAL SIDE OF FARM LIFE."

Mrs. Sarah B. Fritz, Duncannon, Pa.

2. "RURAL EDUCATION."

Dr. A. C. True, Director, Experiment Station, U. S. Dept. of Agriculture, Washington, D. C.

3. "THE SUCCESSFUL FARMER'S EDUCATION."

Prof. Wm. G. Owens, Lewisburg, Pa.

Thursday Morning, June 6, 1907.

MR. S. F. BARBER, Harrisburg, Pa., Chairman.

Call to order 9.00.

1. "ON WHAT DOES THE QUALITY OF BUTTER DEPEND." (40 minutes and 20 minutes for questions.)

Prof. H. E. Van Norman, State College, Pa.

2. "SHEEP HUSBANDRY AND MUTTON GROWING." (40 minutes, and 20 minutes for questions.)

Prof. T. I. Mairs, State College, Pa.

3. "PRACTICAL POULTRY KEEPING FOR PENNSYLVANIA." (40 minutes, and 20 minutes for questions.)

Mr. W. Theo. Wittman, Allentown, Pa.

Thursday Afternoon, June 6, 1907.

MR. B. F. KILLAM, Paupack, Pa., Chairman.

Call to order 1.30.

Opening address by Hon. A. L. MARTIN, Director of Institutes.

1. "WHAT SHOULD BE THE QUALIFICATIONS OF THE STATE LECTURERS."

Mr. J. Newton Glover, County Chairman, Union County, Vicksburg, Pa.

2. "HOW LONG BEFORE DATE OF INSTITUTE SHOULD ADVERTISING BE DONE, AND SHOULD PROGRAM OF MEETING BE USED FOR ADVERTISING PURPOSES."

Hon. Howard G. McGowan, County Chairman, Berks County, Geigers Mills, Pa.

3. "SHOULD COUNTY CHAIRMAN ACT AS PRESIDING OFFICER AT THE DIFFERENT SESSIONS OF HIS INSTITUTE; IF NOT, HOW SHOULD THE PRESIDING OFFICER BE SELECTED."

Rev. T. J. Ferguson, County Chairman, Cumberland County, Mechanicsburg, Pa.

4. "HOW MANY VACATIONS SHOULD OCCUR DURING THE INSTITUTE SEASON."

Hon. T. J. Philips, Atglen, Pa.

5. "SHOULD OUR INSTITUTES BEGIN EARLIER OR LATER IN THE SEASON."

Mr. J. H. Peachey, Belleville, Pa.

6. "IS IT THE DUTY OF CHAIRMEN OF INSTITUTES TO ATTEND ALL MEETINGS IN THEIR COUNTY."

Mr. Horace H. Hall, County Chairman, Potter County, Ellisburg, Pa.

7. "WHAT LEADING SUBJECTS SHOULD BE PRESENTED AT OUR INSTITUTES THE COMING SEASON."

Prof. Frank Menges, York, Pa.

8. "WHAT PORTION OF THE PROGRAM SHOULD BE FILLED BY LOCAL TALENT."

Mr. Henry W. Northup, Dalton, Pa

9. "OBSERVATIONS AND COMMENTS ON INSTITUTE WORK FROM THE LECTURERS' STANDPOINT."

Mr. Robert S. Seeds, Birmingham, Pa.

Note.—This session is devoted to the work of Institute Managers and State Lecturers. Speakers assigned to open the various subjects are limited to ten minutes. In the general discussion, five minutes will be allowed to each speaker.

Thursday Evening, June 6, 1907.

MR. GEO. G. HUTCHISON, Warriors Mark, Pa.

Call to order 7.30.

1. "WHAT NEXT?" (40 minutes, and 20 minutes for questions.)

Dr. Thomas F. Hunt, State College, Pa.

2. "THE LAWS OF PENNSYLVANIA FOR THE IMPROVEMENT AND INSPECTION OF LIVE STOCK." (40 minutes, and 20 minutes for questions.)

Dr. Leonard Pearson, State Veterinarian, Harrisburg, Pa.

3. "HOW THE FEDERAL MEAT INSPECTION IS CONDUCTED." (40 minutes, and 20 minutes for questions.)

Dr. E. E. Tower, Bureau of Animal Industry, P. O. Building, Philadelphia, Pa.

Friday Morning, June 7, 1907.

Call to order 9.00

Delegates, by invitation, to visit farm of Mr. J. W. Eckert and Col. H. C. Trexler's trout pond also fair grounds and the great duck farm.

The following is a complete list, by counties, of dates and places where institutes were held during the fiscal year. There were held a total of 392 days of institute, divided into 981 sessions. The attendance by sessions in the different counties will make a grand total of 146,915 persons who attended farmers' institutes, season of 1906-7.

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1906—1907.

County.	Place.	Date.	Days of institute.	Number of sessions.	Attendance by Sessions.	Speakers Present.		Attendance.		
						Seate.	Local.	Average.	Total.	By counties.
Adams,	Bendersville,	Dec. 17-18,	2	5	48, 88, 30, 66, 225,	4	1	91	457	
	Fairfield,	Dec. 19-20,	2	5	64, 140, 76, 115, 110,	4	1	101	505	
	New Oxford,	Dec. 21-22,	2	5	60, 225, 50, 90, 350,	4	....	155	775	1,737
Allegheny,	Clinton,	Dec. 3-4,	2	5	35, 175, 100, 250, 450,	3	....	202	1,010	
	New Texas,	Dec. 6-7,	2	5	40, 100, 70, 90, 180,	3	1	96	480	
	Bakerstown,	Dec. 7-8,	2	4	30, 175, 25, 50,	3	....	70	280	1,770
Armstrong,	Leechburg,	Feb. 4-5,	2	5	33, 50, 50, 60, 50,	4	2	49	243	
	Maysville,	Feb. 6,	1	3	33, 85, 200,	4	1	106	318	
	Slate Lick,	Feb. 7,	1	2	50, 125,	4	1	88	175	
	Putneyville,	Feb. 8,	1	2	35, 150,	4	....	93	185	
	Grange Hall,	Feb. 9,	1	2	50, 60,	4	....	55	110	1,031
Beaver,	Armstrong School House,	Dec. 31-Jan. 1,	2	5	62, 75, 130, 200, 185,	3	....	130	652	
	Mt. Pleasant,	Jan. 2-3,	2	5	83, 135, 63, 130, 200,	3	....	122	611	
	Church of God,	Jan. 4-5,	2	5	53, 78, 67, 54, 150,	3	....	80	402	1,665
Bedford,	Brick Church,	Mar. 4-5,	2	5	33, 133, 65, 67, 125,	3	1	85	423	
	Breezewood,	Mar. 6-7,	2	5	39, 175, 75, 140, 200,	3	3	126	629	
	Yellow Creek,	Mar. 8-9,	2	5	25, 100, 55, 75, 150,	3	1	81	405	1,457
Berks,	Boyertown,	Feb. 1,	1	3	200, 350, 385,	3	2	312	935	
	Birdsboro,	Feb. 2,	1	3	50, 150, 300,	3	1	167	500	
	Geigertown,	Feb. 4,	1	3	40, 75, 100,	3	....	72	215	
	Sinking Springs,	Feb. 5,	1	2	38, 100,	3	....	69	138	
	Leesport,	Feb. 6-7,	2	5	76, 220, 50, 100, 250,	4	2	139	696	
	Shartlesville,	Feb. 8-9,	2	5	35, 300, 40, 225, 300,	4	....	180	900	3,384
Blair,	Juniata,	Feb. 25-26,	2	5	50, 25, 125, 35, 175,	4	7	82	410	
	Canoe Creek,	Feb. 27,	1	3	50, 90, 115,	4	1	85	255	
	Poplar Run,	Feb. 28-Mar. 1,	2	4	100, 46, 140, 175,	4	2	115	461	1,326

Bradford,	Herricksville,	Dec. 31-Jan. 1,	2	5	35, 85, 75, 150, 225,	3	....	114	570	
	North Orwell,	Jan. 2-3,	2	5	65, 175, 75, 150, 150,	3	1	160	800	
	Warren Center,	Jan. 3-4,	2	5	175, 250, 150, 400, 400,	3	2	275	1,375	
	East Troy,	Jan. 7-8,	2	5	110, 220, 100, 200, 300,	4	2	186	930	
	East Smithfield,	Jan. 8-9,	2	5	50, 300, 100, 250, 400,	3	2	220	1,100	4,790
Bucks,	Pineville,	Jan. 3-4,	2	5	120, 300, 110, 250, 300,	3	....	216	1,080	
	Langhorne,	Jan. 9-10,	2	5	350, 450, 150, 425, 500,	3	....	375	1,875	
	Sellersville,	Jan. 16-17,	2	5	75, 200, 50, 60, 220,	3	....	121	605	
	Plumsteadville,	Jan. 28-29,	2	5	200, 500, 225, 400, 500,	2	....	365	1,825	5,875
Butler,	Conoquenessing,	Jan. 7-8,	2	5	200, 350, 150, 205, 400,	3	....	261	1,305	
	Sarversville,	Jan. 9-10,	2	4	37, 125, 31, 57,	3	....	62	250	
	Eau Claire,	Jan. 11-12,	2	4	73, 300, 115, 85,	3	....	143	573	2,128
Cambria,	Scalp Level,	Feb. 19-20,	2	6	80, 150, 260, 200, 250, 275,	3	4	202	1,215	
	Carrolltown,	Feb. 21-22,	2	5	110, 225, 68, 200, 240,	3	2	169	843	
	Loretta,	Feb. 23-25,	2	5	21, 80, 120, 75, 120,	3	....	83	416	2,474
Cameron,	Driftwood,	Feb. 1-2,	2	4	25, 100, 5, 50,	4	....	45	180	
	Emporium,	Feb. 4-5,	2	5	30, 150, 40, 50, 175,	4	....	89	445	625
Carbon,	Weatherly,	Feb. 11,	1	3	120, 25, 25,	4	....	57	170	
	New Mahoning,	Feb. 12-13,	2	5	25, 110, 20, 45, 80,	4	....	56	280	450
Centre,	Pleasant Gap,	Feb. 1-2,	2	6	15, 75, 300, 30, 150, 315,	6	....	145	887	
	Pine Grove Mills,	Feb. 4,	1	3	75, 150, 250,	3	1	158	475	
	Milesburg,	Feb. 5-6,	2	5	35, 90, 25, 85, 125,	3	1	72	360	1,720
Chester,	Downingtown,	Feb. 14-15,	2	5	90, 160, 110, 180, 220,	3	6	152	760	
	Atglen,	Feb. 18-19,	2	5	125, 240, 120, 250, 350,	3	5	217	1,085	
	Westgrove,	Feb. 20-21,	2	5	120, 60, 70, 180, 230,	3	2	132	660	
	Cedarville,	Feb. 22-23,	2	5	160, 300, 230, 500, 520,	3	3	68	342	2,847
Clarion,	Lickingville,	Dec. 3-4,	2	5	60, 180, 68, 125, 325,	3	....	152	758	
	Salem,	Dec. 5-6,	2	5	58, 110, 58, 98, 210,	3	....	107	534	
	West Freedom,	Dec. 7-8,	2	5	37, 70, 38, 86, 160,	3	....	78	391	1,683
Clearfield,	Blue Ball,	Dec. 17-18,	2	4	100, 35, 75, 155,	3	4	91	365	
	Woodland,	Dec. 19-20,	2	5	50, 100, 30, 60, 120,	3	3	72	360	
	Grampian,	Dec. 21-22,	2	5	100, 225, 130, 190, 250,	3	4	179	895	1,620
(Special),	Trentville,	Feb. 25-26,	2	5	75, 300, 150, 250, 350,	2	4	225	1,125	
	Utahville,	Feb. 27-28,	2	5	40, 140, 55, 125, 225,	2	2	177	585	
	New Washington,	Mar. 1-2,	2	5	55, 95, 86, 150, 214,	2	2	120	600	2,310
Clinton,	McElhattan,	Jan. 28-29,	2	5	65, 200, 50, 60, 200,	4	2	155	575	
	Mill Hall,	Jan. 30-31,	2	5	50, 350, 50, 150, 450,	4	2	210	1,050	
(Special),	Woolrich,	Mar. 1-2,	2	5	50, 150, 50, 100, 300,	3	4	130	650	2,275
Columbia,	Benton,	Feb. 18-19,	2	5	90, 200, 65, 100, 300,	3	2	151	755	
	Berwick,	Feb. 20-21,	2	6	17, 200, 250, 125, 250, 350,	3	3	198	1,192	1,947
Cumberland,	Hogestown,	Jan. 1,	1	3	60, 230, 300,	3	1	197	590	
	Churchtown,	Jan. 2,	1	3	66, 160, 220,	3	1	149	446	
	Plainfield,	Jan. 3,	1	3	55, 88, 169,	3	2	104	312	
	Newburg,	Jan. 4,	1	3	65, 140, 230,	3	3	145	435	
	Jacksonville,	Jan. 5,	1	3	40, 150, 240,	3	....	143	430	2,213
Crawford,	Harmonsburg,	Feb. 13-14,	2	5	90, 230, 20, 115, 235,	3	....	138	690	
	Mosiertown,	Feb. 15-16,	2	5	130, 225, 175, 290, 325,	3	....	229	1,145	
	Maguffintown,	Feb. 18,	1	3	90, 135, 190,	3	....	138	415	
	New Richmond,	Feb. 19-20,	2	5	133, 300, 175, 330, 400,	3	....	268	1,338	
	Riceville,	Feb. 21-22,	2	5	120, 325, 97, 195, 275,	3	....	202	1,012	4,600
Dauphin,	Berrysburg,	Jan. 7-8,	2	5	40, 400, 60, 130, 280,	3	....	182	910	
	Linglestown,	Jan. 10-11,	2	5	35, 190, 40, 175, 225,	4	....	133	665	
	Hershey,	Jan. 11-12,	2	2	27, 80,	4	....	53	107	1,682

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1906-1907—Continued.

County.	Place.	Date.	Days of institute.	Number of sessions.	Attendance by Sessions.	Speakers Present.		Attendance.		
						State.	Local.	Average.	Total.	By counties.
Delaware,	Concordville,	Feb. 27-28,	2	5	60, 250, 40, 150, 350,	4	....	170	850	
	Media,	Feb. 25-26,	2	5	50, 125, 50, 75, 200,	3	....	100	500	
	Newton Square,	Mar. 2,	1	3	50, 100, 175,	3	....	108	325	1,675
Elk,	St. Marys,	Feb. 20-21,	2	5	70, 200, 50, 150, 200,	4	2	134	670	
	Kersey,	Feb. 22,	1	3	50, 100, 175,	4	1	108	325	
	Brockport,	Feb. 23,	1	2	25, 50,	4	....	38	75	1,070
Erie,	West Millcreek,	Feb. 23,	1	3	135, 250, 300,	3	....	228	685	
	East Springfield,	Feb. 25-26,	2	5	125, 300, 200, 350, 450,	3	....	285	1,425	
	West Green,	Feb. 27-28,	2	5	200, 250, 300, 225, 310,	2	3	257	1,285	
	Union City,	Mar. 1-2,	2	5	150, 300, 175, 165, 200,	3	....	198	990	4,385
Fayette,	Flat Woods,	Jan. 14-15,	2	5	46, 100, 85, 140, 135,	4	3	101	506	
	Sandy Hill,	Jan. 16-17,	2	4	27, 50, 20, 37,	4	....	33	134	
	Pt. Marion,	Jan. 18-19,	2	5	35, 110, 35, 160, 225,	4	....	101	565	1,205
Forest,	Tionesta,	Feb. 1-2,	2	5	65, 300, 83, 150, 400,	3	....	199	998	
	Clarington,	Feb. 4-5,	2	5	75, 65, 400, 100, 400,	3	....	208	1,040	2,038
Franklin,	Dry Run,	Dec. 3-4,	2	5	80, 190, 140, 220, 300,	3	....	185	930	
	St. Thomas,	Dec. 5-6,	2	5	40, 80, 75, 90, 120,	3	2	81	405	
	Marion,	Dec. 7-8,	2	5	79, 230, 45, 160, 320,	3	2	167	834	2,169
Fulton,	Green Hill,	Dec. 4-5,	2	5	25, 100, 25, 25, 30,	3	....	41	205	
	Fort Littleton,	Dec. 6-7,	2	5	20, 60, 15, 30, 40,	3	1	33	165	370
Juniata,	East Waterford,	Jan. 2-3,	2	5	30, 170, 35, 120, 200,	3	4	111	555	
	Thompsontown,	Jan. 4-5,	2	5	65, 250, 95, 240, 265,	4	7	183	915	1,470
Jefferson,	Roseville,	Feb. 25-26,	2	5	180, 250, 275, 275, 300,	4	3	256	1,280	
	Knoxdale,	Feb. 26-27,	2	5	75, 275, 125, 200, 300,	2	....	195	975	
	Harmtown,	Feb. 26-27,	2	5	150, 250, 200, 300, 300,	2	3	240	1,200	
	Perry Church,	Feb. 27-28,	2	5	60, 300, 150, 200, 300,	4	1	201	1,010	4,465
Indiana,	Clarksburg,	Feb. 11-12,	2	5	78, 225, 75, 175, 250,	3	9	161	803	
	Marion Centre,	Feb. 13-14,	2	5	225, 450, 145, 250, 360,	4	2	286	1,430	
	Indiana,	Feb. 15-16,	2	5	145, 135, 100, 130, 103	4	3	123	613	
(Special),	Willet,	Feb. 18-19,	2	4	105, 300, 120, 400,	5	5	231	925	3,771
Huntingdon,	Saltillo,	Dec. 8,	1	5	10, 35, 100,	3	1	52	145	
	Trough Creek,	Dec. 17-18,	2	3	30, 85, 90, 100, 150,	2	1	113	455	
	Warriors Mark,	Dec. 19-20,	2	5	50, 250, 35, 75, 250,	2	3	132	660	1,260
Greene,	Oak Forest,	Jan. 4-5,	2	5	60, 120, 100, 150, 175,	4	3	121	605	
	Aleppo,	Jan. 7,	1	3	53, 102, 220	4	1	75	375	
	Jacksonville,	Jan. 8-9,	2	5	40, 65, 45, 100, 200	4	2	90	450	1,430

Lackawanna, ...	Madisonville, ...	Dec. 4, ...	1	2	40, 65,	2	....	53	105	
	Tompkinsville, ...	Dec. 4-5, ...	2	5	27, 102, 40, 70, 125,	4	....	73	364	
	Fleetville, ...	Dec. 5-6, ...	2	4	14, 25, 132, 250,	4	....	105	421	
	Bald Mount, ...	Dec. 6-7, ...	2	5	24, 50, 128, 75, 100,	4	....	75	377	
	Dalton, ...	Dec. 7-8, ...	2	5	20, 58, 40, 100, 125,	4	....	69	343	1,610
Lancaster, ...	Ephrata, ...	Jan. 18-19, ...	2	4	40, 230, 80, 140,	4	1	122	490	
	Quarryville, ...	Feb. 8-9, ...	2	5	85, 250, 44, 170. 360,	4	1	182	909	
	Lampeter, ...	Feb. 11-12, ...	2	5	75, 210, 200, 225, 380,	4	1	218	1,090	
	Neffsville, ...	Feb. 13, ...	1	2	140, 210,	4	2	175	350	
(Summer Insts.), ...	Black Barren Springs, ..	Sept. 11-12, ...	2	5	300, 400, 500, 450, 775,	4	1	485	2,425	
	Rutland Park, ...	Sept. 13, ...	1	3	100, 145, 355,	3	....	200	600	5,861
Lawrence, ...	Ellwood City, ...	Dec. 17-18, ...	2	5	30, 75, 50, 40, 95,	3	....	58	290	
	Hillsville, ...	Dec. 19-20, ...	2	5	25, 57, 47, 53, 175,	3	....	71	357	
	Enon Valley, ...	Dec. 21-22, ...	2	5	43, 200, 27, 47, 190,	3	....	101	507	1,154
Lebanon, ...	Campbelltown, ...	Jan. 12, ...	1	3	18, 35, 30,	4	....	75	221	
	Jonestown, ...	Jan. 14-15, ...	2	5	31, 110, 70, 80, 180,	4	....	91	471	
	Schaefferstown, ...	Jan. 16-17, ...	2	5	54, 176, 44, 89, 186,	4	....	110	549	1,244
Lehigh, ...	New Tripoli, ...	Dec. 17-18, ...	2	5	72, 170, 37, 80, 275,	3	....	127	634	
	Fogelsville, ...	Dec. 19-20, ...	2	5	40, 120, 50, 45, 90,	3	....	70	345	
	Allentown, ...	Dec. 21-22, ...	2	5	100, 110, 76, 135, 100,	4	1	120	521	1,500
Luzerne, ...	Conyngham, ...	Mar. 1-2, ...	2	5	90, 225, 90, 225, 375,	3	1	201	1,005	
	Lehman, ...	Mar. 4, ...	1	3	125, 225, 250,	3	....	200	600	
	Orange, ...	Mar. 5-6, ...	2	5	90, 250, 110, 175, 225,	3	....	170	850	2,445
Lycoming, ...	Elmsport, ...	Dec. 3-4, ...	2	5	30, 60, 40, 120, 235,	3	2	97	485	
	Warrensville, ...	Dec. 5-6, ...	2	5	35, 350, 30, 150, 430,	3	....	195	975	
	Anthony Run, ...	Dec. 7-8, ...	2	5	25, 75, 35, 100, 65,	3	....	60	300	1,780
McKean, ...	Coryville, ...	Feb. 14-15, ...	2	6	30, 100, 175, 100, 100, 100,	4	3	101	605	
	Crosby, ...	Feb. 16, ...	1	2	65, 50,	4	2	58	115	
	Kane, ...	Feb. 18-19, ...	2	5	45, 60, 40, 60, 55,	4	....	51	255	980
(Special), ...	Custer City, ...	Mar. 6-7, ...	2	5	22, 76, 26, 55, 95,	3	2	55	274	1,254
Mercer, ...	Sandy Lake, ...	Feb. 6-7, ...	2	5	80, 250, 30, 100, 300,	3	....	152	760	
	Jackson Center, ...	Feb. 8-9, ...	2	5	100, 550, 40, 300, 650,	3	....	338	1,690	
	Transfer, ...	Feb. 11-12, ...	2	5	150, 305, 150, 250, 325,	4	....	236	1,180	3,630
Mifflin, ...	Vira, ...	Dec. 21-22, ...	2	4	15, 60, 25, 30,	2	....	31	130	
	Belleville, ...	Dec. 31-Jan. 1, ...	2	5	60, 130, 65, 125, 265,	2	1	129	645	775
Monroe, ...	Kresgeville, ...	Feb. 14-15, ...	2	5	35, 100, 30,70, 100,	4	1	67	335	
	Shawnee, ...	Feb. 16, ...	1	3	15, 40, 65,	4	1	40	120	
	Sciota, ...	Feb. 18-19, ...	2	5	40, 100, 40, 80, 125,	4	....	77	385	840
Montgomery, ...	Worcester, ...	Dec. 31-Jan. 1, ...	2	5	80, 125, 100, 200, 400,	4	....	181	905	
	King of Prussia, ...	Jan. 7-8, ...	2	5	95, 200, 175, 200, 200,	3	....	214	1,070	
	Sanatoga, ...	Jan. 14-15, ...	2	5	75, 170, 50, 160, 170,	3	....	145	625	
	Harleysville, ...	Jan. 30-31, ...	2	5	100, 200, 75, 150, 350,	3	....	155	775	3,285
Montour, ...	Washingtonville, ...	Feb. 13-14, ...	2	5	120, 350, 200, 275, 375,	4	1	264	1,320	
	Exchange, ...	Feb. 15, ...	1	3	20, 65, 90,	3	....	35	175	1,495
Northampton, ...	Lower Saucon, ...	Jan. 4-5, ...	2	5	33, 200, 32, 100, 250,	3	1	123	615	
	Ackermanville, ...	Jan. 11-12, ...	2	5	70, 225, 75, 150, 250,	3	1	154	770	
	Bath, ...	Jan. 18-19, ...	2	5	50, 125, 33, 76, 200,	3	2	97	484	2,154
(Special), ...	Redington, ...	Mar. 6-7, ...	2	5	35, 40, 60, 100, 50,	3	1	57	285	
Northumberland, ...	Elysburg, ...	Feb. 7-8, ...	2	5	70, 250, 50, 150, 300,	3	1	164	820	
	Paradise, ...	Feb. 9, ...	1	3	25, 100, 200,	3	1	108	325	
	McEwensville, ...	Feb. 11-12, ...	2	5	50, 150, 60, 180, 275,	4	....	143	715	1,860
Perry, ...	Blain, ...	Jan. 7-8, ...	2	5	130, 450, 175, 300, 350,	4	3	281	1,405	
	Ickesburg, ...	Jan 9, ...	1	3	50, 100, 200,	4	1	117	350	
	Liverpool, ...	Jan. 10-11, ...	2	5	65, 275, 60, 275, 350,	4	5	205	1,025	2,980

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1906-1907—Continued.

County.	Place.	Date.	Days of institute.	Number of sessions.	Attendance by Sessions.	Speakers Present.		Attendance.		
						Seate.	Local.	Average.	Total.	By counties.
Pike,	Greentown,	Feb. 20-21,	2	5	200, 260, 250, 250, 300,	3	....	252	1,260	1,260
Philadelphia,	Cornwells,	Mar. 4-5,	2	5	150, 300, 38, 200, 400,	3	1	238	1,188	1,188
Potter,	Genesee,	Feb. 6-7,	2	5	60, 140, 30, 120, 175,	3	1	85	425	
	Hebron,	Feb. 11,	1	2	20, 30,	3	....	25	50	
	Odin,	Feb. 12-13,	2	5	50, 90, 75, 125, 125,	4	....	93	465	1,040
Schuylkill,	Hegins,	Feb. 25-26,	2	5	75, 200, 100, 180, 300,	3	1	171	855	
	Pinegrove,	Feb. 26,	1	3	25, 40, 150,	3	....	72	215	
	McKeansburg,	Feb. 27,	1	3	30, 75, 165,	3	....	90	270	
	Snyders,	Feb. 28,	1	3	65, 185, 225,	3	....	158	475	1,815
Snyder,	Selinsgrove,	Jan. 12,	1	2	60, 140,	3	....	100	200	
	Middlebury,	Jan. 14-15,	2	5	60, 140, 50, 60, 140,	4	1	90	450	
	Beavertown,	Jan. 16-17,	2	5	75, 250, 60, 65, 250,	3	....	141	705	1,355
Somerset,	Boswell,	Dec. 17-18,	2	5	60, 125, 100, 150, 225,	3	....	132	660	
	Somerset,	Dec. 19-20,	2	6	50, 200, 300, 200, 300, 300,	3	....	225	1,350	
	Meyersdale,	Dec. 21-22,	2	5	90, 200, 85, 200, 200,	4	....	155	775	2,785
Sullivan,	Colley,	Dec. 28-29,	2	5	70, 020, 75, 155, 300,	3	2	160	800	800
Susquehanna,	Uniondale,	Mar. 2,	1	3	50, 125, 175,	3	....	117	350	
	Welsh Hill,	Mar. 4-5,	2	5	100, 150, 80, 175, 250,	3	....	151	775	
	Montrose,	Mar. 6-7,	2	4	45, 25, 125, 75,	3	2	68	270	
	South Auburn,	Mar. 8-9,	2	5	50, 125, 175, 150, 175,	3	....	135	675	2,050
Tioga,	Roseville,	Jan. 15-16,	2	5	150, 225, 60, 200, 250,	3	2	177	885	
	Little March,	Jan. 17-18,	2	4	60, 200, 75, 125,	3	2	92	460	
	Osceola,	Jan. 19,	1	3	100, 175, 300,	3	3	115	575	
	Wellsboro,	Feb. 8-9,	2	4	85, 175, 110, 225,	3	2	119	595	2,515
Union,	New Columbia,	Jan. 28-29,	2	5	75, 350, 65, 160, 360,	5	1	202	1,010	
	Buffalo X Roads,	Jan. 30-31,	2	5	35, 300, 40, 75, 350,	5	....	159	795	1,805
Venango,	Utica,	Jan. 15-16,	2	5	72, 175, 75, 175, 200,	4	....	139	697	
	Breedtown,	Jan. 17-18,	2	5	65, 300, 105, 250, 320,	4	....	208	1,040	1,737
Warren,	Chandlers Valley,	Jan. 19,	1	3	68, 250, 190,	3	....	169	508	
	Lander,	Jan. 28-29,	2	5	105, 200, 82, 190, 225,	3	....	160	802	
	Sugar Grove,	Jan. 30-31,	2	5	100, 300, 100, 165, 300,	3	....	193	965	2,275
Washington,	Midway,	Dec. 31-Jan. 1,	2	5	85, 225, 275, 400, 500,	4	3	297	1,485	
	Buffalo,	Jan. 2-3,	2	5	100, 240, 230, 260, 325,	4	3	231	1,155	
	Centreville,	Jan. 10-11,	2	5	65, 210, 100, 210, 400,	4	4	197	985	3,625

Wayne,	Honesdale,	Feb. 22-23,	2	5	85, 50, 70, 100, 50,	4	....	51	255	
	Aldenville,	Feb. 25,	1	3	40, 110, 60,	3	....	70	210	
	White Valley,	Feb. 26,	1	3	75, 150, 220,	3	....	148	445	
	Pleasant Mt.,	Feb. 27,	1	3	60, 180, 150,	3	....	130	390	
	Winwood,	Feb. 28,	1	2	100, 100,	2	....	100	200	
	Starrucca,	Mar. 1,	1	3	40, 100, 80,	3	....	73	220	1,720
Westmoreland,	Scottdale,	Jan. 28-29,	2	5	80, 125, 80, 127, 125,	4	1	107	537	
	Export,	Jan. 30-31,	2	5	75, 190, 50, 105, 220,	4	1	128	610	
	New Alexandria,	Feb. 1-2,	2	5	75, 130, 60, 150, 150,	4	2	113	565	1,742
Wyoming,	Meshoppen,	Jan. 10-11,	2	4	150, 400, 120, 325,	3	3	249	995	
	Lovelton,	Jan. 12,	1	3	35, 115, 225,	3	2	128	375	
	Tunkhannock,	Jan. 14,	1	3	45, 210, 350,	3	2	202	605	1,975
York,	Fawn Grove,	Jan. 28-29,	2	6	37, 160, 310, 150, 360, 600,	3	1	269	1,617	
	Loganville,	Jan. 30-31,	2	5	66, 340, 95, 200, 400,	3	4	220	1,101	
	Manchester,	Feb. 1-2,	2	5	90, 550, 68, 230, 580,	3	4	303	1,518	
	Dillsburg,	Feb. 4-5,	2	5	180, 300, 140, 310, 350,	4	1	256	1,280	
	Lewisberry,	Feb. 6-7,	2	5	160, 350, 75, 220, 400,	3	1	241	1,205	6,721
	Total,		392	981			252			146,915

LIST OF COUNTY INSTITUTE MANAGERS FOR SEASON OF 1906-7.

County.	Names and Address of Chairman.
Adams,	A. I. Weidner, Arendtsville.
Allegheny,	J. S. Burns, Imperial, R. F. D. No. 1.
Armstrong,	S. S. Blyholder, Neale.
Beaver,	A. L. McKibben, New Sheffield.
Bedford,	W. Clay Lutz, Bedford.
Berks,	Howard G. McGowan, Geiger's Mills.
Blair,	H. L. Harvey, Juniata.
Bradford,	E. E. Chubbuck, Rome, R. F. D. No. 16.
Bucks,	Watson T. Davis, Ivyland.
Butler,	W. H. H. Riddle, Butler.
Cambria,	H. J. Krumenacker, Carrolltown.
Cameron,	W. H. Howard, Emporium.
Carbon,	Brice Brenckman, Weatherly, R. F. D.
Centre,	John A. Woodward, Howard.
Chester,	Dr. M. E. Conard, Westgrove.
Clarion,	S. X. McClellan, Knox.
Clearfield,	E. M. Davis, Grampian.
Clinton,	Joel A. Herr, Milhall, R. F. D.
Crawford,	A. P. Young, Millville.
Columbia,	J. F. Seavy, Seagerstown.
Cumberland,	Rev. T. J. Ferguson, Mechanicsburg.
Dauphin,	S. F. Barber, Harrisburg.
Delaware,	R. M. Heyburn, Ward.
Fayette,	J. B. Werner, St. Mary's.
Elk,	Archie Billings, Edinboro.
Erie,	Sylvester Duff, Smock.
Forest,	C. A. Randall, Tionesta.
Fulton,	J. P. Young Marion.
Franklin,	R. M. Kendall, McConnellsburg.
Greene,	J. W. Stewart, Jefferson.
Huntingdon,	G. G. Hutchison, Warrior's Mark.
Indiana,	S. M. McHenry, Indiana.
Jefferson,	Peter B. Cowan, Brookville.
Juniata,	Matthew Rodgers, Mexico.
Lackawanna,	Horace Seamans, Factoryville.
Lancaster,	W. H. Brosius, Drumore. E. S. Hoover, Lancaster.
Lawrence,	Saml. McCreary, Volant, R. F. D.
Lebanon,	Edward Shuey, Lickdale.
Lehigh,	P. S. Fenstermaker, Allentown.
Luzerne,	J. E. Hildebrandt, Dallas, R. F. D.
Lycoming,	A. J. Kahler, Hughesville.
McKean,	L. W. Howden, Corryville.
Mercer,	W. C. Black, Mercer.
Mifflin,	M. M. Naginey, Milroy.
Monroe,	Randal Bisbing, East Stroudsburg.
Montgomery,	Jason Sexton, North Wales.
Montour,	C. A. Wagner, Ottawa.
Northampton,	Wm. F. Beck, Easton, R. F. D. No. 1.
Northumberland,	I. A. Eschbach, Milton, R. F. D. No. 1.
Perry,	A. T. Holman, Millerstown.
Philadelphia,	Dr. W. H. Ridge, Trevose.
Pike,	B. F. Killam, Paupack.
Potter,	Horace H. Hall, Ellisburg.
Schuylkill,	W. H. Stout, Pinegrove.
Snyder,	Chas. Miller, Salem.
Somerset,	Jacob S. Miller, Friedens.
Sullivan,	E. R. Warburton, Dushore, R. F. D. No. 3.
Susquehanna,	F. A. Davies, Montrose.
Tioga,	F. E. Field, No. 209 Caldwell Ave., Elmira.
Union,	J. Newton Glover, Vicksburg.
Venango,	W. A. Crawford, Cooperstown.
Warren,	Geo. A. Woodside, Sugargrove.
Washington,	D. S. Taylor, Raccoon.
Wayne,	W. E. Perham, Niagara.
Westmoreland,	M. N. Clark, Claridge.
Wyoming,	D. A. Knuppenburg, Lake Carey.
York,	G. F. Barnes, Rossville.

LIST OF INSTITUTE LECTURERS FOR SEASON OF 1906-7.

Armsby, Dr. H. P., State College, Centre County.
Barber, S. F., Box 104, Harrisburg, Dauphin county.
Barclay, Richard D., Haverford, Montgomery county.
Bashore, Dr. Harvey B., West Fairview, Cumberland county.
Beardslee, R. L., Warrenham, Bradford county.
Black, Wm. C., Mercer, Mercer county
Bond, M. S., Danville, Montour county.
Brodhead, C. W., Montrose, Susquehanna county.
Bruckart, J. W., Lititz, Lancaster county.
Burns, J. S., Imperial, R. F. D. No. 1, Allegheny county.
Butz; Prof. Geo. C., State College, Centre county.
Campbell, J. T., Hartstown, Crawford county.
Clark, M. N., Claridge, Westmoreland county
Cooke, Prof. Wells W., No. 1328 Twelfth St., N. W., Washington, D. C.
Cox, J. W., New Wilmington, Lawrence county.
Cure, Z. T., Jermyn, Lackawanna county.
Detrich, Dr. J. D., West Chester, R. F. D. No. 12, Chester county.
Drake, W. M. C., Volant, Lawrence county.
Frear, Dr. Wm., State College, Centre county.
Fritz, Mrs. Sarah B., Duncannon, Perry county.
Funk, Dr. J. H., Boyertown, Berks county.
Hall, Horace H., Ellisburg, Potter county.
Herr, Joel A., Millhall, R. F. D., Clinton county.
Hill, W. F., Chambersburg, Franklin county.
Hoover, E. S., Lancaster, Lancaster county.
Hull, Geo. E., Transfer, R. F. D., Mercer county.
Kahler, A. J., Hughesville, Lycoming county.
Kester, R. P., Grampian, Clearfield county.
Ledy, J. H., Marion, Franklin county.
Lehman, Amos B., Fayetteville, Franklin county.
Lighty, L. W., East Berlin, Adams county.
Mairs, Prof. T. I., State College, Centre county.
Massey, Prof. W. F., No. 205 St. Marks Square, Philadelphia.
McDowell, Prof. M. S., State College, Centre county.
Menges, Prof. Franklin, York, York county.
Miller, Prof. Norman G., Asst. Economic Zoologist, Harrisburg.
Northup, Henry W., Dalton, R. F. D. No. 1, Lackawanna county.
Orr, T. E., Beaver, Beaver county.
Owens, Prof. Wm. G., Lewisburg, Union county.
Peachey, J. H., Belleville, Mifflin county.
Philips, T. J., Atglen, Chester county.
Phillips, E. L., New Bethlehem, Clarion county.
Pillsbury, Prof. J. P., State College, Centre county.
Schock, Oliver D., Asst. Dairy and Food Commissioner, Harrisburg.
Schwarz, R. F., Analomink, Monroe county.
Seeds, R. S., Birmingham, Huntingdon county
Smith, J. O., Trough Creek, Huntingdon county.
Stout, W. H., Pinegrove, Schuylkill county.
Thayer, Dr. I. A., New Castle, Lawrence county.
Tower, Dr. E. E., No. 5414 Osage Avenue, Philadelphia.
Van Norman, Prof. H. E., State College, Centre county.
Wagner, E. J., Harrison city, Westmoreland county.
Wallace, Mrs. Mary A., Ellwood city, Lawrence county.
Watts, D. H., Kerrmoor, Clearfield county.
Waychoff, G. B., Jefferson, Greene county.
Weld, R. J., Sugargrove, Warren county.
Wittman, W. Theo., Allentown, Lehigh county.

The following is a list of Lecturers, Speakers and Essayists who gave instruction at institutes, season of 1906-07, with topics for discussion:

1906-1907.

ARMSBY, DR. H. P., State College, Centre County, Pa.:
1. Balanced Rations.
2. Individuality in Feeding.
3. Feeding-stuffs Guarantees.
4. The Choice of Feeding-stuffs.
5. Some Points Regarding the Handling of Live Stock. (15 to 20 minutes each.)

BARBER, S. F., Box 104, Harrisburg, Dauphin County, Pa.:
1. The Silo Throughout the Year
2. Butter Making on the Farm.
3. Care of Stable Manure and How Best to Apply It.
4. Seeding of Grass for Hay.
5. Care of Milk for Retail Trade.
6. Marketing of Farm Crops.
7. The Importance of Humus or Vegetable Matter in the Soil; Why Most Farms of Our State are Deficient of It.

BARCLAY, RICHARD D., Haverford, Montgomery County, Pa.:
1. Bee-keeping. (60 minutes.)
2. San José Scale. (30 minutes.)
3. Agricultural Education from the Student's Point of View. (30 minutes.)
4. Fancy Stock and Its Management. (40 minutes.)
5. Principles of Spraying. (30 minutes.)

BASHORE, DR. HARVEY B., West Fairview, Cumberland County, Pa.:
1. Farm Hygiene. (15 minutes.)
2. Village Hygiene. (15 minutes.)
3. Good Health—A Much Neglected Crop. (15 minutes.)

BEARDSLEE, R. L., Warrenham, Bradford County, Pa.:
1. How to Establish and Maintain a Dairy.
2. How to Renovate an Impoverished Farm.
3. Raising Skim Milk Calves.
4. Fodder Corn, Silo and Silage.
5. Sheep Husbandry.
6. Potato Culture.
7. The Farmer's Horse.

BLACK, WM. C., Mercer County, Pa.:
1. The Value of Pedigree. (30 minutes.)
2. The Beef Breeds of Cattle. (30 minutes.)
3. Comparison of Beef and Dairy Types for Beef Purposes. (30 minutes.)
4. Cultivation and Uses of Corn Plant. (30 minutes.)
5. Sheep, Breed, Mutton and Wool. (30 minutes.)
7. Raising the Calf. (30 minutes.)
8. Swine, Breed and Feed. (30 minutes.)

BOND, M. S., Danville, Montour County, Pa.:
1. History, Discovery and Culture of the Potato. (30 minutes.)
2. Experience with Commercial Fertilizers for Thirty Years. (30 minutes.)
3. Growing and Marketing Vegetables. (30 minutes.)
4. The Farmer's Garden. (15 minutes.)
5. Soil Restoration. (20 minutes.)
6. Short Talk with Boys and Girls about Staying on the Farm. (20 minutes.)
7. I Don't Know. (15 minutes.)

BRODHEAD, C. W., Montrose, Susquehanna County, Pa.:
1. Care of Horses and Colts' Feet and Teeth. (Illustrated.) (45 minutes.)
2. Horseshoeing. (Illustrated with chart and specimens.) (45 minutes.)
3. Some Things every Horse Owner Should Know. (40 minutes.)
4. Zoology of the Horse. (Illustrated.) (30 minutes.)

BRUCKART, J. W., Lititz, Lancaster County, Pa.:
1. The Poultry Department on the Farm. (45 minutes.)
2. Better Poultry and More of It. (45 minutes.)

3. Success with Poultry in Limited Quarters. (30 minutes.)
4. The Incubator and the Brooder on the Farm. (45 minutes.)
5. Profitable Market Gardening. (45 minutes.)
6. Strawberry and Small Fruit Culture. (45 minutes.)
7. San José Scale. (30 minutes.)
8. Personal Experience with Lime and the Legumes. (30 minutes.)
9. Lights and Shadows of Farm Life. (Evening Lecture.) (45 minutes.)

BURNS, J. S., Imperial, R. F. D. No. 1, Allegheny County, Pa.:
1. Corn Breeding and Selection of Seed. (30 minutes.)
2. Corn: Preparation of Soil and Cultivation. (30 minutes.)
3. Breeding and Care of Swine. (30 minutes.)
4. Sheep Husbandry. (25 minutes.)
5. Cattle Feeding. (25 minutes.)
6. Growing and Preserving Pork for Family Use. (35 minutes.)
7. The Farmer and His Wife. (Evening Lecture.) (30 minutes.)
8. Home Influence. (40 minutes.)
9. Education for Country Children. (35 minutes.)

BUTZ, PROF. GEO. C., State College, Centre County, Pa.:
1. Modern Treatment of Apple Orchards.
2. Peach Culture.
3. Insect Enemies of Farm and Garden.
4. Ornamentation of Home Grounds.
5. Botany of the Farm.
6. Agricultural Education.
7. Small Fruits.
8. Bacteria for Leguminous Crops.

CAMPBELL, J. T., Hartstown, Crawford County, Pa.:
1. Construction of Poultry Houses and Fixtures.
2. Profitable Egg Production. (Illustrated.) (45 minutes.)
3. Lice, Gapes and Poultry Diseases. (20 to 30 minutes.)
4. Experience with Incubators and Brooders. (Lantern slides.) (25 to 30 minutes.)
5. Economic Maintenance of the Productivity of the Soil. (40 to 60 minutes.)
6. Acid Soils and Their Treatment. (Lantern slides.) (45 minutes.)
7. Commercial Potato Growing. (30 minutes.)
8. The Farmer's Garden (20 to 30 minutes.)
9. Crop Rotation in Relation to Soil Improvement. (30 to 40 minutes.)
10. To Have and To Hold. (Evening lecture for young boys and girls.) (40-50 minutes.)
11. Use of Cement and Concrete Work on the Farm. (20-30 minutes.)

CLARK, M. N., Claridge, Westmoreland County, Pa.:
1. Buying and Care of Farm Implements. (20 minutes.)
2. Every Farmer Should Be a Member of the Grange. (20 minutes.)
3. Growing Swine. (20 minutes.)
4. The Farm Journal for the Farmer. (20 minutes.)
5. Theory and Practical Education. (20 minutes.)
6. Marketing the Products of the Farm. (25 minutes.)
7. How to Grow Horses. (15 minutes.)
8. Some of the Mistakes Made on the Farm. (25 minutes.)

CONARD, DR. M. E., Westgrove, Chester County, Pa.:
1. The Dairy Barn and Surroundings.
2. Conditions and Care Necessary to the Production of Market Milk.
3. How to Build Up the Dairy Herd.
4. Some Points on the Feeding of Calves.

COOKE, PROF. WELLS W., No. 1328 Twelfth Street, N. W., Washington, D. C.
1. Soil Fertility and How to Retain It.
2. How to Use the Silo to the Best Advantage.
3. Economical Buying of Stock Foods.
4. Feeding for the Production of the Best Milk.
5. Economical Summer Feeding of Cows.
6. Utilizing the Whole Value of Farm Manure.
7. Modern Methods of Milk Handling.
8. Nature Study in the Country School.
9. Economical Feeding of the Farmer's Family.

COX, JOHN W., New Wilmington, Lawrence County, Pa.:
1. The Easiest and Most Profitable Way to Grow Potatoes. (25 minutes.)
2. Raising and Care of Poultry. (35 minutes.)
3. Increasing Soil Fertility. (25 minutes.)
4. Maintaining Soil Moisture and Vegetable Matter in the Soil. (25 minutes.)
5. Commercial Fertilizer. (25 minutes.)
6. A Practical Education for the Farmer. (25 minutes.)
7. The Formation and Management of the Dairy Herd. (25 minutes.)
8. The San José and Other Insect Pests of Fruit Trees. (20 minutes.)

CURE, Z. T., Jermyn, Lackawanna County, Pa.:
1. Potato Culture. (20 minutes.)
2. Up-to-date Talk on Corn. (20 to 25 minutes.)
3. Economy in the Use of Commercial Fertilizers. (20 minutes.)
4. Production and Care of Orchards. (25 minutes.)
5. Education to the Farmer a Necessity. (30 to 35 minutes.)
6. The Raising and Early Training of Colts; The Profitable Time to Sell, Etc. (30 minutes.)
7. The Handling of Sheep and Production of Early Spring Lambs. (20 minutes.)
8. The Handling of Heifer Calves to and During First Year of Maternity. (20 minutes.)
9. A Talk on the Laws Governing Animal Improvement.

DETRICH, J. D., West Chester, Chester County, Pa.:
1. How to Keep Twenty Head or More of Dairy Animals on Fifteen Acres.
2. Eighteen Years Experience in Soiling.
3. Sixteen Years Experience with Wooden Silo.
4. Shall we Grow Crops on Fifteen Acre Farm and no Fertilizer?
5. Feed, Breed and Care of the Dairy.
6. Breeding and Raising the Dairy Animal.
7. The Agricultural College and the Farmer.
8. The Farmer's Waste Basket.
9. The Small Farm Vs. The Large Farm.
10. Bench, Book and Farm.

DRAKE, W. M. C., Volant, Lawrence County, Pa.:
1. How to Grow Clover. (40 minutes.)
2. Corn Breeding. (40 minutes.)
3. Breeding, Feeding and Care of Farm Animals. (40 minutes.)
4. Keeping a Dairy. (40 minutes.)
5. The Use of Common Fertilizer. (30 minutes.)
6. The Farm as a Factory. (40 minutes.)
7. Potato Culture. (30 minutes.)
8. Fruit Culture. (30 minutes.)
9. The Farmer's Education. (50 minutes.)

FREAR, DR. WM., State College, Centre County, Pa.:
1. Fertilizer Economics. (20 minutes.)
2. The Accumulation and Uses of Humus. (30 minutes.)
3. Condimental Stock Foods; Their Uses and Abuses. (20 minutes.)
4. The Selection of Seed Corn. (30 minutes.)
5. The Gain in Soil Nitrogen Resulting from Leguminous Crops. (20 minutes.)

FRITZ, MRS. SARAH B., Duncannon, Perry County, Pa.:
1. Our Country Homes. (20 minutes.)
2. The Wife a Partner. (25 minutes.)
3. The Mission of Beauty. (25 minutes.)
4. Three Practical Ways of Farmers' Wives Making Money. (15 minutes.)

FUNK, DR. J. H., Boyertown, Berks County, Pa.:
1. Commercial Orcharding. (45 minutes.)
2. Pruning, Fertilizing and Thinning. (45 to 60 minutes.)
3. Spraying. (45 minutes.)
4. San José Scale and Other Insect Pests. (45 minutes.)
5. Small Fruits. (45 minutes.)
6. Birds and Insects. (60 minutes.)
7. The Peach and How to Raise It. (45 minutes.)
8. Potato Culture. (45 to 60 minutes.)

HALL, HORACE H., Ellisburg, Potter County, Pa.:
1. Cheese Dairying.
2. The Silo.
3. Cover for Feed and Fertilizer.
4. Cement Stable Floors.
5. Strawberries for the Home and Market.
6. Farmer Telephones.
7. Why Farmers Should Organize.
8. What Education Should Farmers Have.
9. The Basis of Our Greatness.
10. Our Greatest Benefactors.

HARSHBERGER, PROF. J. W., No. 737 Corinthian Avenue, Philadelphia, Pa.:
1. The Accumulation of Soil Nitrogen. (45 minutes.)
2. The Role of Leguminous Plants. (45 minutes.)
3. The Selection and Breeding of Indian Corn. (45 minutes.)
4. The Rusts of Agricultural Plants and How to Combat Them. (30 minutes.)
5. The Corn Plant; A Nature Study. (30 minutes.)

HERR, JOEL A., Millhall, R. F. D., Clinton County, Pa.:
1. Specialties in Farming. (20 minutes.)
2. Selection and Breeding of Dairy Cows. (20 minutes.)
3. Large Fruit Growing. (30 minutes.)
4. Practical Road Making. (25 minutes.)
5. Farm Fertility. (20 minutes.)
6. The Bright Side of Farm Life. (35 minutes.)
7. Education Through Organization. (30 minutes.)
8. Higher Education and The Means of Getting It. (30 minutes.)
9. The Farmer as a Citizen. (25 minutes.)
10 Soil Moisture. (20 minutes.)

HILL, W. F., Chambersburg, Franklin County, Pa.:
1. Desirable Soil Conditions. (20 minutes.)
2. Saving and Applying Manure. (20 minutes.)
3. Observations in Our Own Country. (20 minutes.)
4. Observations in Foreign Lands. (20 minutes.)
5. Organization; The Present Power. (20 minutes.)
6. Our Education; Our Capital. (20 minutes.)

HOOVER, HON. E. S., Lancaster, Lancaster County, Pa.:
1. Forestry as Pertaining to Farming. (20 minutes.)
2. Education of the Farmer's Son. (15 minutes.)
3. Failures in Farming and the Causes. (15 minutes.)
4. System on the Farm. (15 minutes.)
5. Beautifying the Home Grounds. (15 minutes.)
6. Soil Improvement. (15 minutes.)
7. Cutlivation of Tobacco; Its Curing and Preparation for Market. (15 minutes.)
8. The Proper Time for Harvesting Farm Crops. (15 minutes.)
9. Care of Farm Machinery. (20 minutes.)
10. The Horse; His Breeding, Rearing and Training. (20 minutes.)
11. Growing Trees on the Farm. (15 minutes.)
12. Farmer's Institutes; Their Benefit. (15 minutes.)
13. How Can We Keep up the Fertility of the Soil the Cheapest? (15 minutes.)
14. Wastes on the Farm. (15 minutes.)

HULL, GEO. E., Transfer, R. F. D., Mercer County, Pa.:
1. High Grade Farm Butter. (20 to 25 minutes.)
2. Breed, Feed and Care of the Dairy Cow. (20 minutes.)
3. Construction and Filling of Silos. (25 minutes.)
4. Construction of a Labor Saving Dairy Barn. (20 minutes.)
5. Marketing Farm Products. (30 minutes.)
6. The Farm Water Supply. (25 minutes.)
7. Feeding Steers for Market. (20 minutes.)
8. Some Experience With Sheep. (20 minutes.)
9. Our Farm Homes. (35 to 30 minutes.)

KAHLER, HON. A. J., Hughesville, Lycoming County, Pa.:
1. Soil Fertility.
2. Corn Culture.
3. Taxation.
4. Hogs for Profit.
5. Concentration of Schools in Rural Districts.
6. My Experience with Lime and Commercial Fertilizer.
7. Proper Care of Barnyard Manure.
8. How Best to Keep the Boys on the Farm.
9. Breeding, Treating and Selection of Corn.

KESTER, R. P., Grampian, R. F. D., No. 2, Clearfield County, Pa.:
1. Making the Dairy Pay. (45 minutes.)
2. Dairy Types and Breeds. (30 minutes.)
3. Profitable Feeding of the Dairy Cow. (30 minutes.)
4. The Silo an Essential to Profitable Dairying. (30 minutes.)
5. Poultry Culture. (30 minutes.)
6. Gardening for Home and for Market. (30 minutes.)
7. Intelligent Use of Commercial Fertilizers. (30 minutes.)
8. The Rural Schools. (Evening lecture.) (40 minutes.)
9. Advantages of Rural Life. (Evening lecture.) (40 minutes.)

LEDY, J. H., Marion, Franklin County, Pa.:
1. General Fruit Growing; How to Take Care of Trees.
2. Peach, Apple and Plum Culture.
3. Pruning, Cultivating and Fertilizing the Orchard.
4. The Farmers' Garden.
5. Alfalfa; Its Value and How to Grow It.
6. Small Fruit Culture.
7. Tomatoes and Cantaloups; How to Grow Them.
8. Poultry for Profit, and How to Make Hens Lay in January.
9. San José Scale a Specialty.
10. Crimson Clover and Soja Beans; their Value and How to Grow Them.

LEHMAN, AMOS B., Fayetteville, Franklin County Pa.:
1. Breeding, Feeding and Profit in Hogs.
2. Legumes for Feed and Fertility.
3. Dairy vs. Beef Cattle.
4. Insects, Friends and Foes.
5. Nature Study in the Public Schools.
6. Theory and Practice in Farming
7. Methods and Observation in Culture of Fruits.

LIGHTY, L. W.. East Berlin, Adams County, Pa.:
1. The Farmers' Cow; How to Make Her Profitable. (50 minutes.)
2. Feeding the Dairy Cow. (45 minutes.)
3. Culture and Feeding the Corn Crop. (45 minutes.)
4. Silo Experience and Practice. (30 minutes.)
5. Soiling and Soiling Crops. (30 minutes.)
6. Value, Care and Application of Farm Manure. (30 minutes.)
7. Producing and Marketing Dairy Products. (40 minutes.)
8. Improving and Maintaining the Fertility of Our Soils.
9. The Making of a Home on the Farm. (30 minutes.)
10. Education for our Boys and Girls; What and How. (45 minutes.)

MAIRS, PROF. T. I., State College, Centre County, Pa.:
1. Baby Beef Production for Pennsylvania. (20 to 40 minutes.)
2. Steer Feeding in Pennsylvania. (20 to 40 minutes.)
3. Pork Production. (20-40 minutes.)
4. Mutton Growing. (20 to 40 minutes.)
5. Leguminous Forage Crops as a Source of Protein. (20 to 40 minutes.)
6. Horse Growing for Pennsylvania Farmers. (20-40 minutes.)

MASSEY, PROF. W. F., No. 205 St. Marks Square, Philadelphia, Pa.:
1. The Improvement of the Soil and Rotation of Crops.
2. The Southern Cow Pea and its Place in Pennsylvania.
3. Southern Market Gardening and Its Lessons for our Gardeners.
4. Orchard Planting, Pruning and Culture.
5. Commercial Fertilizing; Their Use and Abuse.

McDOWELL, PROF. M. S., State College, Centre County, Pa.:
1. Commercial Fertilizers.
2. A Few Facts About Bacteria.
3. Insoluble Phosphate.
4. Lime.
5. Agriculture, an Art.

MENGES, PROF. FRANKLIN, York, York County, Pa.:
1. Domestic Chemistry. (30 minutes.)
2. Fixation of Free Nitrogen Explained. (30 minutes.)
3. Nitrification; Conditions Necessary to Produce it. (30 minutes.)
4. Maintenance of Soil Moisture. (30 minutes.)
5. Methods for Raising Hay and Leguminous Crops. (30 minutes.)
6. Various Methods for Crop Rotation. (30 minutes.)
7. Benefits of Crop Breeding. (30 minutes.)
8. The Necessity of Education for the Farmer. (30 minutes.)
9. Denatured Alcohol in Agriculture. (30 minutes.)
10. Insect Friends and Foes of the Farmer. (30 minutes.)

MILLER, PROF. NORMAN G., Assistant Economic Zoologist, Harrisburg, Pa.:
1. Alfalfa; Its Value as a Forage and Fertilizer. (30 minutes.)
2. Fungus Diseases of Fruits and Their Treatment. (35 minutes.)
3. Insects Injurious to Horticultural and Other Crops. (25 minutes.)
4. The Cow Pea and Its Uses. (25 minutes.)
5. Scale Insects and Their Treatment. (25 minutes.)

NORTHUP, HENRY W., Dalton, R. F. D., Lackawanna County, Pa.:
1. Selection, Care and Management of the Dairy.
2. Practical Experience with the Silo.
3. Potato Growing.
4. The Exhaustion and Restoration of our Soil.
5. Fruit Culture.
6. Specialties in Farming.
7. Farm Products and How to Market Them.
8. Nature Study for Country Schools.
9. Educating the Farmer and Increasing His Usefulness.
10. Desirable Country Homes and How to Enjoy Them. (30 minutes.)

ORR, T. E., Beaver, Beaver County, Pa.:
1. Poultry as a Side Line for Farmers.
2. Poultry as a Business.
3. Poultry Houses.
4. Incubators and Brooders.
5. Eggs for City Trade.
6. The Breed or the Feed—Which?
7. Running a One-Horse Farm.

8. Two Good Highways; How They are Made.
9. The Business End of Farming.
10. The Farmer and the Public Schools.

OWENS, PROF. WM. G., Lewisburg, Union County, Pa.:
1. What Chemistry is Doing for the Farm. (60 minutes.)
2. The Successful Farmer's Education. (60 minutes.)
3. Farm Sanitation. (30 minutes.)
4. What Has Been Done by Breeding. (30 minutes.)
5. Improved Fertility. (30 minutes.)
6. Manure or Commercial Fertilizers. (30 minutes.)
7. Bacteria as a Source of Nitrogen. (30 minutes.)
8. Protection from Insect Pests. (30 minutes.)

PEACHEY, J. H., Belleville, Mifflin County, Pa.:
1. Corn Culture.
2. The Home on the Farm. (Illustrated lecture.)
3. Butter Making on the Farm.
4. Breeding and Feeding the Pig.
5. Soil Improvement.
6. The Clover Crop and How to Grow It.
7. Echoes from the Farm. (Illustrated lecture.)
8. The Problem of Education for Country Children. (Illustrated lecture.) (From 30 to 45 minutes each.)

PHILIPS, HON. THOMAS J., Atglen, Chester County, Pa.:
1. Commercial Fertilizers; Their Nature and Use. (40 minutes.)
2. The Silo as I have Found It. (30 minutes.)
3. Is Lime a Fertilizer? How Does it Benefit the Farmer? (35 minutes.)
4. Thirty Years Experience with Dairy Cows. (30 minutes.)
5. Poultry Upon the Farm; A Farmer's Experience. (25 minutes.)
6. The Farmers' Garden. (20 minutes.)
7. Are Farmers Business Men? If Not, Why Not? (35 minutes.)
8. A Peep Through the Key-Hole. (40 minutes.)

PHILLIPS, E. L., New Bethlehem, Clarion County, Pa.:
1. Breeding Animals on the Farm. (20 minutes.)
2. Can the Farm be Made a Success. (30 minutes.)
3. Farm Implements, Selecting, Buying and Caring For. (25 minutes.)
4. Commercial Fertilizers. (30 minutes.)
5. Good Roads; How to Get Them. (25 to 30 minutes.)

PILLSBURY, J. P., State College, Centre County, Pa.:
1. Pruning. (20 minutes.)
2. Strawberry Culture. (20 minutes.)
3. How to Plant An Orchard. (30 minutes.)
4. Care of Ornamental Trees and Shrubs. (20 minutes.)
5. Grafting and Budding. (20 minutes.)

SCHOCK, OLIVER D., Assistant Dairy and Food Commissioner, Harrisburg, Pa.:
1. Enforcing the Pure Food Laws in Pennsylvania.
2. Education for the Farmers' Sons and Daughters.
3. Floriculture in Coutry Homes.
4. Progress in Agriculture.
5. Profitable Poultry on the Farm.
6. Growing Grapes for Pleasure and Profit.
7. The Country Fair.

SCHWARZ, HON. R. F., Analomink, Montgomery County, Pa.:
1. Market Gardening. (45 minutes.)
2. Small Fruit Growing. (30 minutes.)
3. The Commercial Orchard. (35 minutes.)
4. The Orchard for Home Consumption. (30 minutes.)
5. A Thorough Understanding of the Fertilizer Question. (45 minutes.)
6. The Home Mixing of Fertilizer. (30 minutes.)
7. Reclaiming of Worn-Out Soil Without Manure, or Success with Crimson Clover. (60 minutes.)
8. Profit in Poultry. (40 minutes.)
9. The New Road Law and the Farmers' Duty Under It. (30 minutes.)
10. Why Should a Farmer Boy and Girl Be Educated. (45 minutes.) (Illustrated lecture.)
11. Fruits and Vegetables for the Farmer's Table. (40 minutes.) (Illustrated lecture.)

SEEDS, ROBERT S., Birmingham, Huntingdon County, Pa.:
1. Value of Barnyard Manure. (30 minutes.)
2. Soil Improvement, The Keynote of Agriculture. (30 minutes.)
3. The Value of Fertility and Cheapest Way to Get It. (40 minutes.)
4. Education and the Farmer. (20 minutes.)
5. Benefits Derived from Farmers' Institutes. (20 minutes.)
6. What Constitutes a Country Home. (45 minutes)
7. Mistakes in Life Exposed. (60 minutes.)

SMITH, J. O., Calvin, Huntingdon County, Pa.:
1. How Plants Grow; How Plants Feed. (35 minutes.)
2. Foods of the Vegetable World. (30 minutes.)
3. Soils; How Formed; How Made Fertile, Etc. (30 minutes.)
4. Farmers to the Front. (30 minutes.)
5. When is a Man Educated? (30 minutes.)
6. Relation of a Farm. (Entertaining.)

STOUT, W. H., Pinegrove, Schuylkill County, Pa.:
1. Fruit Growing.
2. Market Gardening and Small Fruit Growing.
3. Geological Observations.
4. Bee-Keeping.
5. Manures and Fertilizers.
6. Theory vs. Practice.
7. Redeeming Exhausted Soil.
8. How to Obtain an Education under Difficulties. (30 minutes each.)

SURFACE, PROF. H. A., Economic Zoologist, Harrisburg, Pa.:
1. The Economic Value and Protection of our Native Birds. (40-50 minutes.)
2. General Principles and Methods of Insect Warfare. (40 minutes.)
3. The Hessian Fly in Pennsylvania. (30 minutes.)
4. Our Insect Friends. (Illustrated.) (30-40 minutes.)
5. Nature Study and Agriculture in the Public Schools. (25-30 minutes.)
6. Centralization of Schools. (20 minutes.)
7. Higher Education for Farmers' Boys and Girls. (20-25 minutes.)
8. The Elements of Success. (15-20 minutes.)
9. The Needs of the Farmer. (30-40 minutes.)
11. Practical Bee-Keeping.

THAYER, DR. I. A., New Castle, Lawrence County, Pa.:
1. Tile Draining; Why and How. (40 minutes.)
2. Soil Moisture. (30 minutes.)
3. Preparation of the Seed Bed. (40 minutes.)
4. Stable Manure. (40 minutes.)
5. Commercial Fertilizers. (30 minutes.)
6. The Clover as Fertilizers. (30 minutes.)
7. The Clovers as Food. (30 minutes.)
8. Alfalfa. (30 minutes.)
9. The Principles of Stock Feeding. (40 minutes.)
10. Care of Farm Animal. (40 minutes.)
11. The Farmer's Horse. (30 minutes.)
12. Strawberry Culture. (30 minutes.)
13. Back to Nature. (40-60 minutes.)
14. Home Hygiene. (Evening lecture.) (40 minutes.)
15. The Farmer's Table. (Evening lecture). (40 minutes.)

TOWER, DR. E. E., Hop Bottom, Susquehanna County, Pa.:
1. Anatomy and Physiology of the Horse and Cow. (Illustrated.) (30 minutes each.)
2. Common Diseases of Farm Animals.
3. Contagious Diseases of Farm Animals.
4. Tuberculosis; Symptoms at Different Stages.
5. Rabies.
6. Care of Farm Animals in Disease and Health.
7. Stock Foods and Condition Powders; Their Value and What they Cost the Farmer.

VAN NORMAN, PROF. H. E., State College, Centre County, Pa.:
1. On What Do the Dairy Profits Depend?
3. Helpful and Harmful Bacteria.
3. Why Does the Tests Vary?
4. The Young Folks Chance.
5. Something the Agricultural College and Experiment Station May Do.
6. Feeding Practice.
7. Skim-milk; Butter-milk; Why?
8. Only a Cow; That's the Rub.
9. Cow Stable Devices.
10. Silo and Silage.

WAGNER, F. J., Harrison City, Westmoreland County, Pa.:
1. Soils and Soil Making. (15-20 minutes.)
2. The Business Side of Farming. (15-30 minutes.)
3. Dairying for Profit. (15-20 minutes.)
4. Clover and Its Cultivation. (15-20 minutes.)
5. Education for the Farmer and His Family. (15-20 minutes.)
6. Advantages in Cream Separator. (15 minutes.)

WALLACE, MRS. MARY A., Ellwood City, Lawrence County, Pa.:
1. Centralization of Rural Schools. (30 minutes.)
2. The Country Home; Its Sanitation; Convenience, Etc. (30 minutes.)
3. Thoughts for the Housekeeper. (Illustrated lecture.) (30 minutes.)

4. A Talk with the Country Boys and Girls. (30 minutes.)
5. Domestic Science. (30 minutes.)
6. Food and Care of Babies. (30 minutes.)
7. Country Butter; How to Make It. (20 minutes.)

WATTS, D. H., Kerrmoor, Clearfield County, Pa.:
1. The Dairy Herd and Stable.
2. The Feed and Care of the Dairy Herd.
3. The Silo and Why Profitable.
4. Gilt-edge Butter; How to Make and Sell It.
5. The Apple Orchard and Its Care.
6. The Soil, the Seed Bed and Plant.
7. The Steam Engine as Used on our Farm.
8. Farm Buildings and Blunders.
9. The Farmer of the Future. (Evening Talk.) (30 minutes each.)

WAYCHOFF, G. B., Jefferson, Greene Coune, Pa.:
1. Clover as a Soil Renovator. (40 minutes.)
2. Uses of Lime in Agriculture. (45 minutes.)
3. Berry Culture. (30 minutes.)
4. Profitable Gardening. (30 minutes.)
5. Soil Moisture. (30 minutes.)
6. Value of Humus in Crop Growing. (30 minutes.)
7. The Ideal Education. (Evening lecture.) (45 minutes.)
8. A Study of Plant Roots, and Lessons Farmers should Learn from Them. (30 minutes.)

WITTMAN, W. THEO., Allentown, Lehigh County, Pa.:
1. Why Farmers in the Various Counties of the State are not Getting More Eggs.
2. How to Get Bushels of Eggs Winter and Summer. (60 minutes.)
3. Successful Adaptation of Correct Poultry-keeping Methods with General Farming. (40 minutes.)
4. Fancy or Thoroughbred Poultry; How Sub-divided, Bred, Judged, and Exhibited. (Illustrated with living subjects.) (60 to 90 minutes.)
5. Fine Fruit Growing in Connection with Poultry Culture. (60 minutes.)

DEPARTMENT LECTURERS.

In so far as time and circumstances will permit, the officers of the Department of Agriculture are desirous of engaging in Institute work.

In order to prevent disappointment in the arrangement of programs, it is recommended that Institute Managers first consult the individual whose services they may wish to secure, before placing his name on the program.

Department lecutrers come to these Institutes free of charge, except that they are to be taken from and to the railroad station at the expense of local manager. The topics which they will discuss can be procured by addressing the following officers of the Department of Agriculture:

HON. N. B CRITCHFIELD, Secretary of Agriculture.

HON. A. L. MARTIN, Deputy Secretary and Director of Institutes.

JAMES FOUST, Dairy and Food Commissioner.

PROF. H. A. SURFACE, Economic Zoologist.

DR. LEONARD PEARSON, State Veterinarian.

CROP REPORT.

Whilst the past year was in many respects unfavorable to the growth of full crops of many of the cereal and fruits, the price averaged higher than that of any previous year within the last decade. Exceedingly late Spring made corn planting two weeks later than usual. Cloudy and growing weather first two weeks in September was unfavorable for maturing the crops. This condition being followed about the 20th of September by a severe frost, injured much of the corn in the roasting ear stage, this cutting the crop short more than 50 per cent. Only a limited portion of the State was favored with apples on account largely of severe freezing in the late winter and early spring; however the orchardists who by reason of careful cultivation and spraying to control insect pests and fungus diseases changed to a considerable extent the conditions and thus by careful management procured a fair crop which sold at remunerative prices.

CROP REPORT FOR 1907.

Giving Prices of Farm Products and Live Stock, with Farm Wages and Board, in Pennsylvania, by Counties. Collected by A. L. Martin, Deputy Secretary of Agriculture.

Counties.	Cereals.					Hay.		Live Stock.											
	Wheat.	Corn.	Oats.	Rye.	Buckwheat.	Hay, clover.	Hay, timothy.	Horses, average.	Mules, average.	Cows, average.	Lambs, average.	Ewes, average.	Steers, fat, per pound.	Steers for feeding, per pound.	Swine, shoats, per pound.	Fat hogs, per pound.	Chickens, dressed, per pound	Chickens, live, per pound.
Adams,	$0 90	$0 70	$0 50	$0 75	$0 75	$12 00	$16 00	$150 00	$175 00	$40 00	$4 00	$5 00	$0 05	$0 04	$0 06	$0 07	$0 14	$0 10
Allegheny,	90	80	65	75	75	15 00	18 00	150 00	160 00	40 00	4 50	5 50	06	05	06	07	17	11
Armstrong,	90	65	65	65	60	14 00	18 00	150 00	170 00	40 00	4 50	5 50	06	05	06	07	16	10
Beaver,	1 00	75	60	70	80	11 50	16 00	150 00	170 00	35 00	4 50	5 00	05	04	07	08	17	12
Bedford,	1 00	75	55	75	70	12 00	16 00	150 00	175 00	35 00	4 50	5 50	06	04	06	08	15	10
Berks,	95	65	55	......	......	16 00	20 00	140 00	150 00	45 00	4 00	5 00	05	04	06	08	18	11
Blair,	1 00	70	50	65	70	14 00	16 00	175 00	150 00	35 00	4 00	4 50	06	05	06	07	14	10
Bradford,	95	65	55	80	75	12 00	15 00	150 00	....	25 00	4 50	5 50	05	04	06	06	11	09
Bucks,	1 00	75	55	75	70	15 00	18 00	160 00	150 00	50 00	5 50	6 50	06	04	09	09	16	12
Butler,	90	60	55	65	70	12 00	14 00	150 00	125 00	37 00	4 00	6 00	05	04	06	07	16	12
Cambria,	1 00	75	60	75	65	15 00	18 00	150 00	150 00	40 00	5 00	6 00	06	04	06	08	18	15
Cameron,	1 00	85	70	80	80	15 00	18 00	150 00	150 00	35 00	3 50	4 00	05	04	07	08	18	14
Carbon,	1 00	80	60	80	65	16 00	20 00	150 00	160 00	35 00	3 50	....	05	04	06	08	16	14
Centre,	85	65	50	70	60	15 00	18 00	150 00	150 00	35 00	4 00	6 00	05	04	06	07	16	11
Chester,	90	60	50	75	75	14 00	18 00	150 00	150 00	45 00	4 50	5 50	06	05	07	08	15	12
Clarion,	85	65	55	75	65	12 00	15 00	175 00	....	35 00	4 00	5 00	05	04	06	07	14	10
Clearfield,	95	60	50	75	60	15 00	18 00	150 00	125 00	35 00	3 50	5 00	07	05	07	09	20	14
Clinton,	90	60	45	65	65	11 00	14 00	140 00	....	35 00	5 00	5 50	05	04	08	09	15	12
Columbia,	85	65	50	70	70	14 00	17 00	150 00	175 00	35 00	4 50	4 00	05	04	07	09	14	10
Crawford,	1 00	75	55	70	70	10 00	12 00	125 00	....	30 00	4 50	5 00	05	04	05	06	14	10

Cumberland,	90	60	45	65	55	12 00	16 00	140 00	150 00	40 00	4 50	4 00	05	04	06	07	14	10
Dauphin,	90	65	45	70	70	12 50	16 00	150 00	160 00	35 00	4 00	5 00	05	04	08	08	14	10
Delaware,	95	70	60	80	90	16 00	20 00	150 00	175 00	40 00	5 00	6 00	07	06	09	09	18	14
Elk,	1 05	75	60	90	90	16 00	18 00	175 00	150 00	40 00	4 50	5 50	07	06	09	08	18	12
Erie,	95	65	50	70	70	12 00	14 00	125 00	....	35 00	4 00	5 00	05	04	06	07	18	10
Fayette,	90	75	60	80	75	14 50	18 00	150 00	160 00	40 00	4 00	5 00	05	04	06	07	16	12
Forest,	1 00	70	55	80	65	12 00	16 00	150 00	....	35 00	4 00	5 00	04	03	06	08	15	10
Franklin,	95	60	50	65	......	12 00	15 00	160 00	160 00	40 00	4 50	6 00	05	04	06	08	14	10
Fulton,	85	60	45	60	60	10 00	12 50	125 00	140 00	30 00	4 00	4 00	04	03	06	07	14	09
Greene,	90	75	55	80	75	11 00	14 00	150 00	175 00	40 00	3 50	4 00	05	04	06	07	15	10
Huntingdon,	85	65	45	65	60	14 00	16 00	150 00	175 00	35 00	3 75	5 00	05	04	07	08	15	09
Indiana,	85	75	60	70	65	12 00	15 00	140 00	150 00	35 00	4 00	5 00	05	04	06	07	15	10
Jefferson,	90	70	60	75	60	14 00	16 00	150 00	150 00	30 00	3 50	4 50	04	03	06	08	16	10
Juniata,	90	60	45	60	55	14 00	16 00	140 00	150 00	35 00	4 50	5 00	05	04	07	09	14	09
Lackawanna,	......	70	60	75	70	14 00	16 00	150 00	150 00	40 00	4 50	5 00	05	04	08	09	16	12
Lancaster,	90	70	50	70	......	12 00	17 00	150 00	150 00	40 00	4 50	5 00	05	04	08	09	14	10
Lawrence,	95	65	55	75	70	14 00	16 00	125 00	150 00	40 00	4 00	4 50	05	04	06	07	18	12
Lebanon,	90	65	50	75	......	14 00	18 00	150 00	160 00	45 00	5 00	4 00	05	04	07	08	16	10
Lehigh,	90	60	50	70	70	15 00	18 00	150 00	175 00	40 00	....	....	06	04	09	09	16	12
Luzerne,	95	70	60	80	75	16 00	20 00	175 00	175 00	40 00	5 00	4 00	05	04	09	08	16	12
Lycoming,	1 00	75	60	80	80	16 00	18 00	160 00	....	40 00	....	....	05	04	07	09	18	10
McKean,	1 05	70	60	90	65	12 50	16 00	150 00	....	35 00	4 00	5 00	04	03	07	08	15	10
Mercer,	90	65	50	70	50	9 00	12 00	150 00	125 00	40 00	4 00	5 00	05	04	05	06	15	10
Mifflin,	95	60	40	70	......	13 00	16 00	150 00	140 00	35 00	4 00	5 00	05	04	06	07	12	09
Monroe,	1 05	75	60	80	75	13 00	17 00	150 00	150 00	35 00	4 00	5 00	04	03	09	09	14	10
Montgomery,	1 00	70	55	85	75	14 00	18 00	140 00	150 00	45 00	4 00	5 00	05	04	07	09	18	14
Montour,	1 00	60	45	70	65	12 00	17 00	150 00	175 00	25 00	4 50	4 50	06	04	06	08	16	10
Northampton,	95	70	55	70	70	15 00	18 00	150 00	175 00	40 00	5 00	5 00	06	05	07	08	16	10
Northumberland,	95	70	55	75	70	14 00	18 00	150 00	150 00	45 00	5 00	5 00	05	04	06	08	15	11
Perry,	95	65	50	70	65	12 00	15 00	150 00	160 00	35 00	5 00	5 00	05	04	06	08	15	09
Philadelphia,	1 00	65	50	60	......	15 00	28 00	150 00	160 00	45 00	....	....	06	05	......	......	18	12
Pike,	1 05	70	60	75	70	15 00	18 00	150 00	175 00	30 00	4 50	4 00	05	04	06	08	14	10
Potter,	......	......	55	......	75	12 00	14 00	150 00	....	20 00	3 50	3 50	05	04	06	07	14	09
Schuylkill,	90	80	60	70	70	15 00	20 00	150 00	175 00	35 00	....	....	05	04	08	09	16	12
Snyder,	95	65	45	60	55	14 00	18 00	150 00	150 00	3[illegible] 00	3 50	4 00	05	04	06	08	12	08
Somerset,	90	70	55	70	55	14 00	17 00	150 00	140 00	35 00	5 00	4 00	05	04	06	08	16	11
Sullivan,	1 10	70	55	70	65	12 00	16 00	150 00	....	20 00	4 00	5 50	04	03	06	07	14	10
Susquehanna,	......	70	55	80	70	11 00	15 00	125 00	140 00	35 00	4 00	4 00	......	......	06	07	15	10
Tioga,	1 00	60	50	70	65	12 00	16 00	125 00	140 00	25 00	4 50	5 00	04	03	05	06	10	08
Union,	95	55	45	65	60	12 00	16 00	150 00	150 00	40 00	4 50	4 50	05	04	06	07	14	10
Venango,	90	65	55	80	65	15 00	17 00	125 00	......	30 00	4 00	4 50	04	03	06	07	17	10
Warren,	1 05	70	55	75	65	15 00	17 00	140 00	....	35 00	4 00	4 00	05	04	05	08	16	10
Washington,	95	65	......	90	......	12 00	14 00	150 00	....	40 00	4 00	4 50	06	......	06	07	20	12
Wayne,	......	65	55	80	80	14 00	16 00	140 00	....	35 00	....	....	......	......	06	07	16	10
Westmoreland,	1 00	70	60	75	......	16 00	18 00	200 00	150 00	45 00	5 50	5 00	06	05	06	07	16	11
Wyoming,	1 00	65	60	75	70	12 00	16 00	150 00	175 00	35 00	4 00	4 50	05	04	06	08	15	10
York,	90	65	45	70	......	12 00	16 00	140 00	150 00	40 00	4 00	4 00	05	04	07	08	14	10
Average,	$0 95	$0 65	$0 53	$0 73	$0 68	$13 00	$16 50	$148 00	$155 00	$37 00	$4 25	$4 75	$0 05	$0 04	$0 06	$0 08	$0 15	$0 10

CROP REPORT FOR 1907—Continued.

Counties.	Vegetables, Fruit, Etc.														
	Apples, per bushel.	Peaches, per bushel.	Pears, per bushel.	Plums, per quart.	Cherries, per quart.	Blackberries, per quart.	Raspberries, per quart.	Potatoes, per bushel.	Butter, per pound, at store.	Butter, per pound, at market.	Milk, wholesale, 100 pounds.	Milk, retail, per quart.	Eggs, per dozen.	Tobacco, leaf, per pound.	Honey, per pound.
Adams,	$0 60	$1 25	$0 50	$0 07	$0 08	$0 07	$0 08	$0 55	$0 22	$0 28	$1 20	$0 06	$0 28	....	$0 18
Allegheny,	1 00	2 00	1 50	10	09	09	10	85	28	34	1 30	07	30	....	18
Armstrong,	80	1 00	1 25	09	09	10	08	85	30	35	2 00	07	30	....	18
Beaver,	1 00	2 50	2 00	10	10	08	09	95	28	34	....	08	35	....	20
Bedford,	75	2 00	2 00	06	07	07	10	75	26	30	....	07	30	....	20
Berks,	60	2 00	1 00	08	08	09	09	60	30	35	2 00	06	34	....	22
Blair,	80	1 50	1 00	07	09	08	08	70	28	32	1 60	06	27	$0 15	18
Bradford,	50	....	....	....	....	10	12	55	23	27	1 30	04	28	....	15
Bucks,	60	1 50	80	10	14	10	10	70	32	35	1 50	06	28	....	....
Butler,	1 00	2 00	1 00	08	10	10	10	75	25	30	....	07	25	....	17
Cambria,	1 00	2 00	1 50	10	09	10	10	90	30	32	....	07	28	....	18
Cameron,	1 00	2 00	1 25	....	....	12	12	90	28	30	1 50	06	30	....	18
Carbon,	80	1 75	....	10	10	08	10	75	28	32	1 75	06	30	....	....
Centre,	65	2 00	1 00	08	08	08	08	55	25	28	1 60	06	28	....	18
Chester,	60	1 75	80	10	12	12	14	60	30	35	1 75	07	30	....	20
Clarion,	90	....	1 00	08	10	08	12	75	26	30	1 80	06	28	....	18
Clearfield,	90	1 80	1 00	08	10	08	10	80	30	32	1 60	07	28	....	15
Clinton,	65	....	1 25	08	10	10	10	75	30	34	1 40	06	25	12	16
Columbia,	70	2 00	1 10	06	07	07	07	60	28	32	....	06	25	....	16
Crawford,	80	2 00	1 10	08	10	09	10	75	26	28	1 10	06	22	....	16
Cumberland,	65	1 50	80	07	08	08	08	55	25	30	1 50	06	28	....	15
Dauphin,	45	1 80	70	08	07	08	08	65	24	28	1 80	07	28	....	20
Delaware,	1 00	....	1 00	10	10	10	12	80	35	40	1 50	08	35	....	20
Elk,	90	....	1 00	08	09	07	10	80	30	32	1 40	06	30	....	18

Erie,	90	1 75	1 00	07	09	08	09	75	30	34	1 60	06	30	....	18
Fayette,	90	2 00	1 10	10	08	09	09	80	30	32	1 40	06	30	....	18
Forest,	90	1 60	1 25	10	10	10	12	90	28	30	....	06	28	....	20
Franklin,	65	1 50	1 10	08	07	10	09	60	25	28	1 25	06	26	....	18
Fulton,	50	1 40	75	....	08	06	07	60	23	25	....	05	20	....	14
Greene,	80	1 25	1 25	10	10	10	10	80	25	28	....	07	20	....	18
Huntingdon,	60	1 75	1 50	10	08	06	08	70	24	26	1 80	06	20	....	18
Indiana,	70	1 50	1 00	10	07	06	09	75	22	25	....	06	20	....	15
Jefferson,	90	2 00	1 25	10	09	09	09	75	22	25	....	07	25	....	16
Juniata,	60	1 50	1 00	06	07	06	07	75	22	25	1 50	05	22	....	20
Lackawanna,	65	....	1 00	06	10	10	12	75	27	30	1 40	06	28	....	14
Lancaster,	60	1 00	85	10	08	10	10	55	28	32	1 60	06	30	12	20
Lawrence,	1 00	1 25	1 10	10	10	12	12	70	26	30	1 20	07	30	....	18
Lebanon,	60	1 25	80	10	10	08	08	55	25	30	1 10	05	22	11	22
Lehigh,	60	1 25	80	10	08	08	10	50	28	30	1 20	06	28	....	....
Luzerne,	80	1 50	1 10	10	14	10	12	70	28	32	1 60	07	30	....	14
Lycoming,	55	....	....	....	....	....	....	65	30	32	1 80	06	30	....	13
McKean,	75	90	1 50	....	....	10	12	70	28	30	1 20	06	24	....	15
Mercer,	75	1 50	1 70	08	10	08	10	70	25	28	1 30	07	22	....	17
Mifflin,	50	1 50	1 00	08	08	08	08	75	25	28	....	06	28	....	16
Monroe,	70	1 75	1 50	10	08	07	10	70	28	30	1 10	06	25	....	18
Montgomery,	50	1 50	75	08	10	10	09	60	34	35	1 40	06	28	....	20
Montour,	55	1 75	1 00	07	10	08	10	65	26	30	1 60	07	26	....	16
Northampton,	60	1 50	1 00	08	09	08	10	60	28	32	1 60	07	30	....	20
Northumberland,	55	1 25	80	08	08	09	10	65	25	32	1 40	06	28	....	20
Perry,	50	1 25	90	06	08	08	08	60	26	28	1 60	06	25	....	18
Philadelphia,	85	....	....	....	....	....	....	90	30	34	....	07	32	....	....
Pike,	50	1 00	1 50	08	08	07	08	70	25	26	1 60	06	30	....	14
Potter,	50	....	....	....	....	....	....	50	28	30	1 40	05	26	....	15
Schuylkill,	75	1 00	1 25	08	09	09	10	70	28	32	1 60	07	28	....	25
Snyder,	60	2 00	1 00	07	08	09	10	50	26	30	1 50	06	28	....	16
Somerset,	70	1 00	1 10	10	10	08	09	75	28	32	1 40	06	26	....	16
Sullivan,	45	....	90	06	08	10	10	60	25	28	1 40	05	25	....	12
Susquehanna,	60	....	1 00	10	10	08	09	70	30	32	1 50	05	28	....	15
Tioga,	45	1 25	1 00	10	08	07	08	55	26	30	1 40	05	25	....	15
Union,	50	1 50	1 00	10	08	08	10	50	22	25	1 50	06	22	....	20
Venango,	90	....	1 50	08	10	08	10	90	25	28	1 50	06	25	....	15
Warren,	70	1 25	1 40	10	12	10	12	80	25	28	1 40	06	28	....	16
Washington,	50	....	....	....	....	....	....	85	25	30	1 20	07	30	....	20
Wayne,	75	....	75	....	08	10	12	60	28	30	1 50	06	25	....	....
Westmoreland,	90	....	....	....	....	....	12	90	30	32	....	08	28	....	....
Wyoming,	60	1 50	1 00	10	09	09	10	60	30	32	1 60	07	30	....	15
York,	60	1 25	1 00	06	10	07	07	60	25	30	1 50	06	24	....	18
Average,	$0 70	$1 50	$1 10	$0 08	$0 09	$0 08	$0 09	$0 70	$0 27	$0 30	$1 50	$0 06	$0 27	$0 12	$0 17

CROP REPORT FOR 1907—Continued.

Counties.	Wool.						Farm Land, Value per Acre.		Farm Wages.						
	Short, unwashed.	Short, washed.	Medium, unwashed.	Medium, washed.	Long, unwashed.	Long, washed.	Improved.	Average.	By year, with board.	Summer months only.	Whole year, without board.	Harvest, by day.	By day, with board.	By day, without board.	Household help, female, with board, per week.
Adams,	$0 23	$0 31	$0 27	$0 34	$0 28	$0 34	$35 00	$25 00	$200 00	$20 00	$280 00	$1 75	$1 00	$1 25	$2 50
Allegheny,	25	34	26	35	....	....	90 00	70 00	240 00	25 00	300 00	1 75	1 25	1 50	3 00
Armstrong,	....	....	....	....	....	....	55 00	40 00	240 00	25 00	300 00	1 75	1 25	1 50	3 00
Beaver,	24	32	24	31	25	33	35 00	25 00	250 00	30 00	360 00	1 75	1 25	1 50	4 00
Bedford,	28	35	28	35	28	35	45 00	30 00	250 00	25 00	300 00	1 50	1 00	1 25	3 00
Berks,	....	....	....	....	....	....	60 00	40 00	240 00	20 00	300 00	1 50	1 00	1 25	2 50
Blair,	27	30	28	30	28	32	70 00	40 00	225 00	22 00	350 00	1 75	1 25	1 75	2 50
Bradford,	27	31	28	32	30	34	28 00	20 00	200 00	20 00	200 00	1 75	1 00	1 25	2 75
Bucks,	....	....	....	....	....	....	65 00	45 00	220 00	22 00	250 00	2 00	1 00	1 50	3 00
Butler,	30	....	....	....	....	....	65 00	35 00	200 00	25 00	300 00	1 75	1 00	1 50	3 00
Cambria,	30	35	32	36	34	38	60 00	30 00	300 00	30 00	375 00	2 00	1 25	1 75	3 00
Cameron,	....	....	....	....	....	....	35 00	20 00	280 00	25 00	350 00	1 75	1 10	1 50	3 00
Carbon,	....	....	....	....	....	....	50 00	35 00	240 00	25 00	300 00	1 75	1 00	1 50	2 50
Centre,	28	....	....	....	....	....	50 00	30 00	200 00	20 00	300 00	1 75	1 25	1 50	2 00
Chester,	....	....	....	....	....	....	65 00	50 00	240 00	25 00	360 00	2 00	1 40	1 75	2 50
Clarion,	28	30	28	30	30	32	50 00	30 00	240 00	24 00	340 00	2 00	1 40	1 75	3 00
Clearfield,	....	....	....	....	....	....	35 00	20 00	250 00	25 00	350 00	1 75	1 00	1 50	2 50
Clinton,	20	30	20	30	20	30	60 00	50 00	180 00	20 00	250 00	1 50	1 00	1 25	2 50
Columbia,	....	....	....	....	....	....	45 00	35 00	200 00	25 00	280 00	1 75	1 25	1 50	2 50
Crawford,	25	30	26	32	27	34	40 00	25 00	200 00	25 00	300 00	1 75	1 10	1 50	3 00
Cumberland,	....	....	....	....	....	....	65 00	50 00	180 00	17 00	250 00	1 75	1 00	1 25	2 00
Dauphin,	....	....	....	....	....	....	80 00	60 00	200 00	18 00	300 00	1 75	1 25	1 50	2 50

Delaware,	....	....	....	....	....	....	125 00	85 00	240 00	24 00	400 00	2 00	1 25	1 60	3 50
Elk,	30	....	30	....	30	....	55 00	20 00	240 00	24 00	360 00	1 75	1 25	1 50	3 00
Erie,	....	....	....	....	....	....	90 00	60 00	280 00	26 00	420 00	2 00	1 25	1 50	3 00
Fayette,	24	32	30	34	30	36	100 00	60 00	240 00	25 00	360 00	2 00	1 25	1 50	3 00
Forest,	28	30	29	32	30	34	50 00	25 00	240 00	25 00	380 00	2 00	1 25	1 60	3 00
Franklin,	....	....	....	....	....	....	70 00	45 00	200 00	18 00	300 00	1 50	1 00	1 40	2 00
Fulton,	25	30	27	32	28	33	55 00	30 00	180 00	16 00	250 00	1 50	1 00	1 25	2 00
Greene,	24	30	28	33	28	33	70 00	50 00	200 00	18 00	260 00	1 50	1 00	1 25	2 00
Huntingdon,	....	....	....	....	....	....	30 00	20 00	180 00	18 00	260 00	1 50	1 00	1 25	2 50
Indiana,	24	29	26	30	28	32	55 00	30 00	220 00	25 00	300 00	1 50	1 00	1 25	3 00
Jefferson,	25	30	30	35	34	38	45 00	20 00	180 00	20 00	280 00	1 75	1 00	1 25	3 00
Juniata,	28	....	....	....	....	....	45 00	25 00	180 00	22 00	260 00	1 50	1 00	1 25	2 00
Lackawanna,	30	....	....	....	....	....	55 00	35 00	240 00	25 00	360 00	2 00	1 25	1 75	3 00
Lancaster,	25	30	26	30	27	32	125 00	90 00	240 00	25 00	320 00	1 75	1 00	1 25	2 50
Lawrence,	26	30	28	32	32	34	60 00	40 00	260 00	25 00	380 00	2 00	1 25	1 50	3 00
Lebanon,	25	....	....	....	....	....	95 00	45 00	200 00	20 00	300 00	1 50	1 00	1 25	2 00
Lehigh,	....	....	....	....	....	....	70 00	45 00	180 00	20 00	280 00	1 50	1 00	1 25	2 50
Luzerne,	....	....	....	....	....	....	75 00	45 00	200 00	22 00	300 00	1 75	1 00	1 40	2 50
Lycoming,	....	....	....	....	....	....	55 00	30 00	240 00	25 00	320 00	1 75	1 00	1 50	2 00
McKean,	....	....	28	....	....	....	40 00	20 00	175 00	18 00	260 00	2 00	1 00	1 50	3 50
Mercer,	26	30	27	31	28	32	40 00	30 00	200 00	20 00	300 00	2 00	1 00	1 50	3 00
Mifflin,	....	....	....	....	....	....	80 00	60 00	200 00	22 00	300 00	1 75	1 00	1 50	2 00
Monroe,	....	....	....	....	....	....	40 00	25 00	180 00	22 00	300 00	1 75	1 00	1 25	3 00
Montgomery,	....	....	....	....	....	....	75 00	55 00	200 00	25 00	320 00	2 00	1 25	1 50	3 00
Montour,	26	34	26	35	26	35	70 00	40 00	200 00	22 00	300 00	1 50	1 00	1 25	2 50
Northampton,	26	28	26	30	....	....	55 00	40 00	200 00	22 00	300 00	2 00	1 00	1 40	3 00
Northumberland,	26	....	....	....	....	....	55 00	40 00	180 00	22 00	300 00	2 00	1 25	1 50	2 50
Perry,	....	....	....	....	....	....	60 00	40 00	200 00	20 00	300 00	1 50	1 00	1 25	2 50
Philadelphia,	....	....	....	....	....	....	100 00	70 00	280 00	25 00	380 00	2 00	1 25	1 50	3 50
Pike,	27	30	....	30	....	30	45 00	25 00	200 00	22 00	300 00	1 75	1 00	1 25	4 00
Potter,	28	....	....	....	....	....	35 00	20 00	220 00	22 00	340 00	2 00	1 25	1 75	3 00
Schuylkill,	....	....	....	....	....	....	55 00	30 00	180 00	20 00	300 00	1 75	1 25	1 50	3 00
Snyder,	....	....	....	....	....	....	100 00	55 00	180 00	20 00	280 00	2 00	1 00	1 25	2 00
Somerset,	27	30	28	32	28	32	60 00	35 00	220 00	25 00	340 00	2 00	1 00	1 50	3 00
Sullivan,	24	30	....	....	....	....	50 00	25 00	200 00	22 00	300 00	2 00	1 25	1 50	3 00
Susquehanna,	24	28	....	....	....	....	35 00	20 00	200 00	20 00	300 00	2 00	1 25	1 75	2 50
Tioga,	26	34	27	35	28	36	45 00	30 00	220 00	25 00	325 00	2 00	1 25	1 75	2 50
Union,	24	....	25	....	26	....	80 00	50 00	200 00	18 00	325 00	1 75	1 00	1 50	2 50
Venango,	26	31	27	33	27	33	30 00	20 00	240 00	20 00	320 00	2 00	1 25	1 50	3 00
Warren,	....	....	....	....	....	....	35 00	20 00	240 00	25 00	360 00	2 00	1 50	1 75	3 00
Washington,	28	32	30	33	30	33	75 00	55 00	240 00	25 00	320 00	2 00	1 50	1 75	3 00
Wayne,	....	....	....	....	....	....	30 00	20 00	225 00	22 00	300 00	2 00	1 25	1 50	3 00
Westmoreland,	....	....	....	....	....	....	80 00	45 00	250 00	30 00	360 00	2 25	1 50	2 00	3 00
Wyoming,	....	....	30	....	....	....	55 00	35 00	240 00	22 00	360 00	2 00	1 25	1 50	3 00
York,	....	....	....	....	....	....	45 00	25 00	180 00	20 00	300 00	1 50	1 00	1 50	2 50
Average,	$0 26	$0 31	$0 27	$0 32	$0 28	$0 33	$60 00	$38 00	$220 00	$22 50	$315 00	$1 75	$1 10	$1 45	$2 75

The following gives the acreage, amount produced and value of Cereals and Hay grown in Pennsylvania; also the number and value of the different Farm Animals, and Pennsylvania's rank among the different states of the Union for the various products enumerated, in the year 1906.

CEREALS, HAY AND FARM PRODUCTS.

	Acreage.	Production.	Value.	Standing.
Rye,	346,265	6,025,011	$3,856,007	1st.
Potatoes,	253,797	23,850,918	13,598,443	2nd.
Buckwheat,	253,797	4,788,000	2,729,160	2nd.
Wheat,	1,642,553	29,073,188	22,095,623	9th.
Corn,	1,441,797	57,960,239	30,139,324	12th.
Oats,	1,161,186	31,816,496	12,090,268	11th.
Total,	....	....	$138,023,427	....

FARM ANIMALS.

	Number.	Value.	Standing.
Horses,	697,010	$66,127,689	11th.
Mules,	40,864	5,024,210	18th.
Milch cows,	1,141,494	41,093,784	3rd.
Other cattle,	984,750	17,479,308	15th.
Sheep,	1,102,058	5,358,799	12th.
Hogs,	689,685	9,303,039	13th.
Total,	....	$144,381,829	....

The following comparison of these tables for the past four years shows an almost uniform advance in the various products of Pennsylvania:

TABLE OF COMPARISON.

	1902.	1903.	1904.	1905.	1906.	1907.
Wheat,	$0.73	$0.75	$1.08	$0.83	$0.78	$0.95
Corn,	.45	.57	.62	.57	.55	.65
Oats,	.37	.41	.44	.37	.40	.53
Rye,	.53	.60	.70	.63	.61	.73
Buckwheat,	.43	.57	.58	.56	.58	.68
Hay, clover,	9.43	11.40	10.50	10.00	11.00	11.00
Hay, timothy,	10.47	14.00	12.00	12.00	13.50	16.50
Horses, average,	84.00	115.00	120.00	131.00	145.00	148.00
Mules, average,	77.00	120.00	125.00	139.00	155.00	155.00
Cows, average,	28.00	33.00	35.00	35.00	38.00	37.00
Lambs, average,	2.76	3.50	3.50	3.95	4.15	4.25
Ewes, average,	2.81	3.45	3.50	4.10	4.50	4.75
Steers, fat, per pound,	.05	.04	.04¼	.04	.05	.05
Steers, for feeding, per pound,	.03	.03	.03½	.03	.04	.04
Swine, shoats; per pound,	.06	.06	.06	.05	.06	.06
Hogs, fat, per pound,	.06	.06	.06½	.06	.07	.08
Chickens, dressed, per pound,	.11	.14	.13	.15	.15	.15
Chickens, live, per pound,	.08	.10	.10	.10	.11	.10
Apples, per bushel,	.35	.50	.44	.70	.55	.70
Peaches, per basket,	.75	1.15	.82	.90	1.10	1.50
Pears, per bushel,	.81	.98	.94	.90	.90	1.10
Plums, per quart,	.06	.07	.08	.07	.07	.08
Cherries, per quart,	.06	.08	.08	.08	.07	.09
Blackberries, per quart,	.07	.07	.08	.07	.07	.08
Raspberries, per quart,	.08	.08	.09	.08	.08	.09
Potatoes, per bushel,	.50	.58	.52	.59	.60	.70
Butter, per pound, at store,	.18	.24	.22	.22	.23	.27
Butter, per pound, at market,	.22	.24	.24	.25	.27	.30
Milk, wholesale, per 100 pounds,	1.16	1.41	1.50	1.30	1.50	1.50
Milk, retail, per quart,	.05	.05	.05	.05	.06	.06
Eggs, per dozen,	.18	.22	.24	.24	.25	.27
Wool, short, unwashed,	.16	.18	.21	.25	.25	.26
Wool, short, washed,	.17	.24	.28	.31	.30	.31
Wool, medium, unwashed,	.17	.18	.22	.26	.26	.27
Wool, medium, washed,	.20	.25	.30	.32	.32	.32
Wool, long, unwashed,	.15	.19	.23	.29	.30	.28
Wool, washed,	.24	.25	.31	.34	.34	.33
Farm land, improved, value per acre,	49.00	56.50	57.00	55.00	60.00	60.00
Farm land, value per acre, average,	33.00	39.00	37.00	35.00	40.00	38.00
Farm wages by year, with board,	153.00	187.00	185.00	190.00	210.00	225.00
Farm wages, summer months only,	17.00	20.00	20.00	19.00	20.00	22.50
Farm wages, by day, with board,	.86	1.00	1.00	1.00	1.10	1.45
Farm wages, by day, without board,	1.15	1.40	1.35	1.35	1.40	1.45
Farm wages, whole year, without board,	196.00	280.00	300.00	295.00	300.00	315.00
Farm wages, harvest, by day,	1.23	1.55	1.60	1.60	1.65	1.75
Farm wages, household help, female,	2.05	2.35	2.50	2.50	2.50	2.75

AGRICULTURAL SOCIETIES.

The County Agricultural and Horticultural Societies of the State are rapidly adjusting their conditions to the needs of advanced agriculture. Pool selling and other forms of gambling and games of chance are gradually giving way to legitimate agricultural exhibits. The recent act of the Legislature making a conditionally appropriation to these societies will no doubt accomplish much in the way of encouraging strictly agricultural exhibits at these fairs. We have distributed, where requested, many copies of the act and will continue to do so when requested to unless the supply should become exhausted.

The attendance for 1906 was 1,829,389, as compared with the previous year, 975,100, shows an increase of 854,289, or almost double the attendance over the year 1905; total membership, 18,852, previous year, 11,015, an increase of 7,837; membership fees, $46,729.45. previous year, $7,530, increase $39,199.45; amount paid in premiums, $99,603.82, previous year, $116,039.32, decrease, $16,489.50; amount offered in premiums for 1907, $159,145.00, previous year, $143,460.00, increase of $16,489.50.

List of County and Local Agricultural Societies, with Names and Addresses of Presidents and Secretaries, and Dates for Holding Fall Exhibitions of 1907, Etc.

County.	Corporate Name of Society.	Name and Address of President.	Name and Address of Secretary.
	State Horticultural Association of Pennsylvania,	Gabriel Hiester, Harrisburg,	Enos B. Engle, Waynesboro.
	Grangers Picnic Exhibition,	R. H. Thomas, Mechanicsburg,	H. S. Mohler, Mechanicsburg.
	Patrons of Husbandry,	Leonard Rhone, Centre Hall,	George Dale, State College.
Adams,	Adams County Agricultural Association,	A. Roberts, Gettysburg, R. F. D.,	A. I. Weidner, Arendtsville.
Armstrong,	Dayton Agricultural and Mechanical Association,	J. C. Borland, Dayton,	C. W. Cochran, Dayton.
Armstrong,	Armstrong County Fair Association,	R. P. Marshall, Kittanning,	W. E. Noble, Kittanning .
Beaver,	Hookstown Fair Association,	Clark Thompson, Hookstown,	Allen McDonald, Hookstown.
Bedford,	Bedford County Agricultural Society,	David W. Lee, Bedford,	Wm. I. Eicholtz, Bedford.
Berks,	Agricultural and Horticultural Asso. of Berks County,	James McGowan, Geigers Mills,	H. Seidel Throm, Reading.
Berks,	Kutztown Fair Association,	J. B. Esser, Kutztown,	Cyrus J. Rhode, Kutztown.
Bradford,	Bradford County Agricultural Society,	W. J. McCabe, Towanda,	S. Bergenpark, Towanda.
Bradford,	Troy Agricultural Society,	Liston Bliss, Troy,	D. F. Pomeroy, Troy.
Butler,	Butler Driving Park and Fair Association,	Geo. A. Schaffner, Butler,	W. B. Purvis, Butler.
Cambria,	Cambria Agricultural Association,	Charles Yaeckle, Patton R. F. D. No. 1,	J. V. Maucher, M. D., Carrolltown.
Cameron,	Cameron County Agricultural Society,	F. X. Blumle, Emporium,	N. A. Ostrum, Emporium.
Carbon,	Carbon County Industrial Society,	C. E. Brinkman, Lehighton,	A. F. Greenawalt, Lehighton.
Chester,	Oxford Agricultural Association,	Henry Cope, Lincoln University,	T. F. Grier, Oxford.
Clarion,	Clarion County Fair Association,	Dennis Conner, Clarion,	S. S. Laughlin, Clarion.
Clinton,	Clinton County Agricultural Society,	J. A. Herr, Mill Hall R. F. D.,	J. R. Porter, Mackeyville.
Columbia,	Columbia County Agricultural, Horticultural and Mechanical Association,	F. P. Hagenbuch, Light Street,	A. N. Yost, Bloomsburg.
Crawford,	Conneaut Lake Agricultural Association,	H. O. Holcomb, Conneaut Lake,	Chas. T. Byers, Conneaut Lake.
Cumberland,	Agricultural Association of Cumberland County,	Charles H. Mullin, Mt. Holly Springs,	W. H. McCrea, Carlisle.
Cumberland,	Hogestown Stock Show,	John C. Parke, New Kensington R. F. D. No. 1,	J. S. Coble, Mechanicsburg R. F. D. No. 4.
Dauphin,	Gratz Agricultural Society,	Israel Daniel, Gratz,	Harry Smith, Gratz.
Dauphin,	Middletown Fair Association,	Dr. Colin S. Few, Middletown,	Geo. W. Rodfong, Middletown.
Erie,	Wattsburg Agricultural Society,	W. H. Cornell, Wattsburg,	A. L. Phelps, Wattsburg.
Erie,	Corry Fair and Driving Park Association,	J. J. Desmond, Corry,	Stephen D. Horn, Corry.
Greene,	Greene County Agricultural and Manufacturing Society,	F. Blackshere, Carmichaels,	Geo. L. Hathaway, Carmichaels.
Indiana,	Indiana County Agricultural Society,	M. F. Jamison, Indiana,	David Blair, Indiana.
Jefferson,	Jefferson County Agricultural Society and Driving Park Association,	Samuel Arthurs, Brookville,	George W. Stewart, Brookville.
Juniata,	Juniata County Agricultural Society,	Matthew Rodgers, Mexico,	James N. Groninger, Port Royal.
Lackawanna,	Lackawanna Grange Fair Association,	J. A. Yeager, Aberdeen,	Lionel Winship, Moscow.
Lancaster,	Lancaster County Agricultural and Horticultural Society,	H. M. Mayer, Roherestown,	F. R. Diffenderfer, Lancaster.
Lawrence,	Lawrence County Agricultural and Horticultural Society,	Samuel McCreary, Volant R. F. D.,	Chas. G. Martin, New Castle.
Lawrence,	Pulaski Fair and Agricultural Society,	Geo. Watson, West Middlesex,	James S. Wood, Pulaski.
Lebanon,	Lebanon Valley Fair Association,	W. H. Bollman, Lebanon,	J. A. Bollman, Lebanon.
Lebanon,	Lebanon County Agricultural and Horticultural Asso.,	John H. Bennetch, Richhland,	S. B. Heilman, Heilmandale.
Lehigh,	Lehigh County Agricultural Society,	John W. Echert, Egypt,	Harry B. Schall, No. 531 Hamilton St., Allentown.
Lycoming,	Muncy Valley Farmers' Club,	S. D. Townsend, Hughesville,	T. C. Corson, Hughesville.

Mercer,	Mercer Central Agricultural Association,	A. J. M. Kean, Mercer,	W. T. McCoy, Mercer.
Mercer,	Mercer County Agricultural Society,	J. A. Bond, Sandy Lake,	Charles B. Hines, Stoneboro.
Monroe,	Monroe County Agricultural Society,	J. S. Williams, Stroudsburg,	John C. Bensinger, Stroudsburg.
Northampton,	Northampton County Agricultural Society,	Joseph A. Happel, Tatamy,	J. R. Reinheimer, Nazareth.
Northampton,	Pennsylvania State Fair Association,	J. Walter Lovatt, Bethlehem,	H. A. Groman, Bethlehem.
Northumberland,	Milton Fair Association,	Wm. H. Hackenburg, Milton,	Edwin Paul, Milton.
Perry,	Perry County Agricultural Society,	D. H. Sheibly, Landisburg,	J. C. F. Stephens, Newport.
Philadelphia,	Pennsylvania Horticultural Society,	James W. Paul, Jr., 5th and Chestnut Streets,	David Rust, Horticultural Hall, Phila.
Somerset,	Somerset County Agricultural Society,	P. K. Moore, Trent,	H. J. Hoffman, Trent.
Sullivan,	Sullivan County Agricultural Society,	O. N. Molyneux, Dushore,	A. G. Little, Forksville.
Susquehanna,	Susquehanna County Agricultural Society,	Dr. J. E. Butterfield, Montrose,	F. L. Leonard, Montrose.
Susquehanna,	Harford Agricultural Society,	E. E. Jones, Harford,	H. S. Estabrook, Harford.
Tioga,	Cowanesque Valley Agricultural Society,	Gilbert Davis, Westfield,	J. W. Smith, Westfield.
Tioga,	Smythe Park Association,	B. Moody, Mansfield,	J. A. Elliott, Mansfield.
Tioga,	Tioga County Pomona Grange No. 30,	E. B. Dorsett, Mansfield,	E. R. Mulford, Wellsboro.
Union,	Union County Agricultural Society,	Frank W. Getz, Lewisburg,	C. Dale Wolfe, Bucknell.
Washington,	Union Agricultural Association,	J. H. Murchland, Hanlin Station,	R. P. Stevenson, Burgettstown.
Warren,	Warren County Farmers' and Breeders' Association,	Herbert White, Lander,	R. J. Weld, Sugargrove.
Wayne,	Wayne County Agricultural Society,	W. L. Ferguson, Seelyville,	Emerson W. Gammell, Honesdale.
Westmoreland,	Westmoreland Agricultural Society,	F. D. Barnhart, Mt. Pleasant,	W. F. Holtzer, Greensburg, R. F. D. No. 1.
Wyoming,	Wyoming County Agricultural Society,	D. W. Stark, Tunkhannock,	W. N. Reynolds, Tunkhannock.
York,	York County Agricultural Society,	John H. Wogan, York,	Edward Chapin, York.
York,	Hanover Agricultural Society,	R. M. Wirt, Hanover,	M. O. Smith, Hanover.

List of County and Local Agricultural Societies, with Names and Addresses of Presidents and Secretaries, and Dates for Holding Fall Exhibitions of 1907, Etc.—Continued.

County.	Corporate Name of Society.	Attendance, 1906.	Race track.	Membership.		Premiums.		Held 1907.	
				Number.	Fee.	Paid, 1906.	Offered, 1907.	Place.	Date.
	State Horticultural Association of Pennsylvania.			150	$80 00				No fair.
	Granger's Picnic Exhibition,	40,000		7				Williams Grove,	Aug. 26-30.
	Patrons of Husbandry,	20,000		1,500	100 00	$100 00	$100 00	Grange Park, Centre Hall.	Sept. 14-20.
Adams,	Adams County Agricultural Association,			35					No fair.
Armstrong,	Dayton Agricultural and Mechanical Association.	20,000	½ mile,	280	10 00	3,500 00	3,500 00	Dayton,	Sept. 24-27.
Armstrong,	Armstrong County Fair Association,	35,000	½ mile,	60	Stock co.	5,000 00	5,000 00	Kittanning,	Aug. 13-16.
Beaver,	Hookstown Fair Association,	6,500	1-3 mile,	9	50 00	700 00	850 00	Hookstown,	Aug. 27-29.
Bedford,	Bedford County Agricultural Society,		½ mile,					Bedford,	Oct. 1-3.
Berks,	Agricultural and Horticultural Association of Berks County.	30,000	½ mile,	234	234 00	1,600 00	3,000 00	Reading,	Oct. 1-4.
Berks,	Kutztown Fair Association,	18,000	½ mile,	375	12,000 00	2,500 00	3,000 00	Kutztown,	Sept. 24-27.
Bradford,	Bradford County Agricultural Society,	11,800	½ mile,	200		1,298 80	2,500 00	Towanda,	Sept. 24-27.
Bradford,	Troy Agricultural Society,	10,000	½ mile,	10	Stock co.	775 00	1,800 00	Troy,	Sept. 10-13.
Butler,	Butler Driving and Fair Association,	35,000	½ mile,	300	Stock co.	4,426 70	3,500 00	Butler,	Aug. 20-23.
Cambria,	Cambria County Agricultural Association,		½ mile,	377	3,770 00	3,000 00	3,600 00	Carrolltown,	Sept. 3-6.
Cameron,	Cameron County Agricultural Society,	500			100 00			Emporium,	Sept. 18-20.
Carbon,	Carbon County Industrial Society,	18,000	½ mile,	30	10,000 00	267 00	Not decided.	Lehighton,	Sept. 24-27.
Chester,	Oxford Agricultural Association,	15,000	½ mile,		Stock co.	2,000 00		Oxford,	Sept. 25-27.
Clarion,	Clarion County Fair Association,	14,000	½ mile,	220		2,400 00	4,000 00	Clarion,	Sept. 10-13.
Clinton,	Clinton County Agricultural Society,								No fair.
Columbia,	Columbia County Agricultural, Horticultural and Mechanical Association.	30,000	½ mile,	396	3,960 00	6,856 98	7,000 00	Bloomsburg,	Oct. 8-11.
Crawford,	Central Crawford Agricultural Society,	10,000	1-3 mile,			1,000 00	1,500 00	Cambridge Springs,	Aug. 21-24.
Crawford,	Conneaut Lake Agricultural Association,	45,000	½ mile,	300	4,500 00	4,500 00	4,500 00	Conneaut Lake,	Aug. 26-30.
Cumberland,	Agricultural Association of Cumberland County.	22,000	½ mile,	60	Stock co.	4,000 00	4,000 00	Carlisle,	Sept. 24-27.
Cumberland,	Hogestown Horse and Cattle Show,	5,000						Hogestown,	June 14.
Dauphin,	Middletown Fair Association,	26,000	½ mile,	259	Stock co.	3,500 00	3,500 00	Middletown,	Sept. 3-6.
Dauphin,	Gratz Agricultural and Horticultural Association.	3,000	½ mile,	19				Gratz,	Aug. 20-23.
Erie,	Corry Fair and Driving Park Association,	13,789	½ mile,	101		2,417 70	5,000 00	Corry,	Sept. 10-13.

Erie,	Wattsburg Agricultural Society,	5,000	½ mile,	340	1,380 45	1,603 99	700 00	Wattsburg,	Sept. 3-6.
Greene,	Greene County Agricultural and Manufacturing Society.	7,000	1-3 mile,	300	450 00	2,500 00	2,500 00	Carmichaels,	Sept. 24-27.
Indiana,	Indiana County Agricultural Society,	50,000	½ mile,			3,000 00	3,000 00	Indiana,	Sept. 3-6.
Jefferson,	Jefferson County Agricultural and Driving Park Association.	40,000	½ mile,	800	8,000 00	2,000 00	2,000 00	Brookville,	Sept. 3-6.
Juniata,	Juniata County Agricultural Society,	14,000	½ mile,	114	Stock co.	1,100 00	1,500 00	Port Royal,	Sept. 11-13.
Lackawanna,	Lackawanna Grange Fair Association,			46	225 00	200 00	225 00	Madisonville,	Sept. 25-27.
Lancaster,	Lancaster County Agricultural and Horticultural Society.								No fair.
Lawrence,	Lawrence County Agricultural and Horticultural Society.			40					No fair.
Lawrence,	Pulaski Fair and Agricultural Society,	14,000	½ mile,	202		5,200 00	5,000 00	Pulaski,	Sept. 17-19.
Lebanon,	Lebanon Valley Fair Association,	35,000	½ mile,	400	Stock co.	3,200 00	4,000 00	Lebanon,	Aug. 27-30.
Lebanon,	Lebanon County Agricultural and Horticultural Association.								No fair.
Lehigh,	Lehigh County Agricultural Society,	200,000	½ mile,	902		25,000 00	25,000 00	Allentown,	Sept. 17-20.
Lycoming,	Muncy Valley Farmers' Club,	10,000	½ mile,	102		1,500 00	2,500 00	Hughesville,	Sept. 17-20.
Mercer,	Mercer County Agricultural Society,	24,000	½ mile,		Stock co.	2,100 00	2,500 00	Stonesboro,	Sept. 24-26.
Mercer,	Mercer Central Agricultural Society,	20,000	½ mile,			2,800 00	4,000 00	Mercer,	Sept. 10-12.
Monroe,	Monroe County Agricultural Society,	6,000	½ mile,	85	Stock co.	450 00	450 00	Stroudsburg,	Oct. 1-4.
Northampton,	Northampton County Agricultural Society,	58,000	½ mile,	325		9,500 00	10,000 00	Nazareth,	Sept. 10-13.
Northampton,	Pennsylvania State Fair Association,	60,000	½ mile,			2,500 00	2,500 00	Bethlehem,	Sept. 3-6.
Northumberland,	Milton Fair Association,	20,000	½ mile,	39	Stock co.	3,500 00	3,500 00	Milton,	Oct. 1-4.
Perry,	Perry County Agricultural Society,	8,000	½ mile,	350		1,200 00	Not decided.	Newport,	Sept. 17-20.
Philadelphia,	Pennsylvania Horticultural Society,			860	1,800 00	2,240 00	2,470 00	Horticultural Hall, Philadelphia.	Nov. 12-15.
Somerset,	Somerset County Agricultural Society,			20	10 00				No fair.
Sullivan,	Sullivan County Agricultural Society,	4,000	1-3 mile,	62		249 45	700 00	Forksville,	Oct. 1-3.
Susquehanna,	Susquehanna County Agricultural Society,	5,000		50	10 00	850 00	850 00	Montrose,	Sept. 18-19.
Susquehanna,	Harford Agricultural Society,	4,000				820 00	1,200 00	Harford,	Sept. 25-26.
Tioga,	Cowanesque Valley Agricultural Society,	12,000	½ mile,	50		1,000 00	1,000 00	Westfield,	Sept. 10-13.
Tioga,	Smythe Park Association,	35,000	½ mile,	40	Stock co.	1,500 00	3,500 00	Mansfield,	Sept. 24-27.
Union,	Union County Agricultural Society,	30,000	½ mile,	202	Stock co.	4,000 00	4,000 00	Lewisburg,	Sept. 24-27.
Washington,	Union Agricultural Association,	1,800	1-3 mile,	2,000	Stock co.	2,400 00	Not decided.	Burgettstown,	Oct. 1-3.
Warren,	Warren County Farmers' and Breeders' Association.			40	25 00				Not decided.
Wayne,	Wayne County Agricultural Society,	12,000	½ mile,	15		1,500 00	2,700 00	Honesdale,	Not decided.
Westmoreland,	Westmoreland Agricultural Society,	15,000	½ mile,	81	25 00	3,197 00	4,000 00	Youngwood,	Sept. 10-13.
Wyoming,	Wyoming County Agricultural Society,	6,000	½ mile,	80		1,000 00	1,000 00	Tunkhannock,	Not decided.
York,	York County Agricultural Society,	63,000	½ mile,	205		5,300 00	8,000 00	York,	Oct. 7-11.
York,	Hanover Agricultural Society,	20,000	½ mile,	50	Stock co.	2,300 00	4,000 00	Hanover,	Sept. 10-13.
Total,		1,827,389		18,852	$46,729 45	$99,603 82	$159,145 00		

CONCLUSION.

Pennsylvania with her diversified branch of agriculture demands more special instruction than in most localities of the United States since we grow most of the cereals and legumes, the greatest variety of fruits, animals breeding in all the leading strains is carried on, poultry for eggs and for market is rapidly emerging from a side line to a leading industry. The outlook for the future is most encouraging. The demand for accurate instruction in every direction is increasing and can only be met by appropriations in some measure commensurate to the broadening field of our operations.

Too much credit can not be given to our efficient County Chairmen and Local Managers and faithful labors of the State Instructors, which brought the degree of success that attended the past year's Institutes.

Very respectfully,

A. L. MARTIN,
Director of Institutes.

REPORT OF THE DAIRY AND FOOD COMMISSIONER.

HARRISBURG, PA., *December 31, 1907.*

Hon. N. B. Critchfield, *Secretary of Agriculture, Harrisburg, Pa.*

Dear Sir: In compliance with law, I have the honor to herewith respectfully submit a report of the work of the Dairy and Food Division of the Pennsylvania Department of Agriculture for the period intervening from April 16th., 1907, the date of my commission as Dairy and Food Commissioner of this Commonwealth, to December 31st., 1907, inclusive.

The duties of the office have been performed with a deep sense of its obligations and responsibilities and with an earnest purpose to serve the people fairly and impartially, to the end that the greatest possible amount of good might be accomplished for the benefit of the people of Pennsylvania.

WHAT DUTIES THE BUREAU OWES TO THE COMMONWEALTH.

The health, the morals and the culture of the people are the foundation of society; the State promotes them under its police power which is necessarily a permanent power in any government. This declaration is founded upon the judicial opinion expressed in the Quo-Warranto proceedings instituted to test the constitutionality of the law creating the office of Dairy and Food Commissioner of Pennsylvania.

It is evident that in the suppression of food adulteration, it stands as true as in surgery, that "the merciful doctor makes the wound foul." As a logical sequence, the dairy and food authorities are exercising special alertness in the supervision of their districts, and these special agents are trying to do all that is possible to repress violations of the dairy and food laws. The main objects to be attained are first, to prevent, and secondly to repress such wrong-doing, and for these purposes they are placed in full charge and held to an accountability for the conditions within their local districts.

While these special agents of the Bureau have met many difficulties in the performance of their duty, earnest thanks are due to each and all of them for arduous work conscientiously performed

HOW INCUMBENT DUTIES ARE PERFORMED.

In the conduct of the business of the Bureau, the following administrative policies are pursued:

The education of those specially interested in the manufacture and sale of food and dairy products.

Making public the violations of the laws placed under its administration for enforcement.

Instituting proper legal proceedings against all who are found to be violating the laws.

The correspondence of the Bureau shows conclusively that a large proportion of the public desire to be law-abiding citizens, and that there is a general willingness to secure a compliance with the laws. The Bureau is always willing to furnish information to correspondents whenever it can be supplied without prejudicing its own interests. Just as soon as the public realized that the laws were being enforced vigorously, justly and honestly, the laws were respected and the people protected from fraud.

The general knowledge of these facts has resulted in a successful termination of prosecutions. Courts and magistrates can bear testimony to the fact that whenever a case is instituted, nothing is left undone to prove that it is a righteous and proper cause for legal redress; consequently, the very small percentage of failures to secure a conviction.

MANUFACTURERS, JOBBERS AND DEALERS VIGILANT.

Never in the history of any State have merchants taken a more active and earnest part in proposed pure food legislation than that which was witnessed at Harrisburg last Winter when the Tustin Pure Food bill was pending. Hundreds of the leading jobbers as well as manufacturers visited the State Capitol, to appear before the several committees to present their views and to convince those in authority that they were favorable to banishing impure and harmful goods from the markets of Pennsylvania.

These vigilant merchants came from necessity and self-interest, but they stood together as a unit in demanding legislation that was fair and equitable to all legitimate business interests. Their protective movement resulted successfully, although there are those who are of the opinion that some of the provisions of the present law may at a later period be declared unconstitutional.

Good and effective laws are of the greatest importance to the public; they should not be formulated hurriedly nor should they be the work of professional sensationalists. It is the individual who has a ripe business experience, who stands well in his community and who has due regard for proper and legal principles whose advice will be helpful in framing proper legislation.

We cannot do otherwise than commend these representatives of the various trade interest for their zeal and activity displayed, which again verified the adage that "in unity there is strength."

CONTINUED WARFARE AGAINST ADULTERATION.

That the criminal practice of polluting and adulterating the food used by the American people had assumed such gigantic proportions as to embrace almost 90 per cent. of the food, drinks and drugs used in the United States, is an uncontradicted fact. Public analysts will bear out the veracity of the statement. This same condition prevailed in Pennsylvania, hence the drastic legislation that was passed in 1895. The Congressional action only followed after the work that was done in this State had borne fruit, as it was here that the public learned more fully than anywhere else that there were hordes of unscrupulous men who grew rich at the expense of the lives of children and invalids in particular, and the health of the whole community in general.

The chemists' reports filed in the Dairy and Food Division tell stories that thrill the reader. The deception practiced was more far-reaching than is usually supposed. An increasing mortality of children resulted from giving them milk containing formaldehyde, which is the principal article used in embalming the dead. Candy contained terra-alba, chrome-yellow, shellac, coal-tar dyes, sulphites, etc. Alum and sulphate of copper were found in bread, while pepper contained much foreign matter. Maple sugar and maple syrup were misnomers, glucose and cane sugar predominating in some brands. A blend of sulphuric and hydro-chloric acid was sold as vinegar. Acids were painted on ham and other meat to give them the appearance of smoked meat, and sulphites were employed to "revive" the spoiled and odorous Hamburg steak.

To-day there is a marked dimunition of these evil practices, and the leading and best grocers realize that the day of adulterations and impositions has passed; that it is worth while to cater to the best trade, and to supply all patrons with a pure quality of food necessities; that in return for their time and knowledge, they are entitled to a good reputation for honesty, a trait that will help to build up a permanent trade and a good name.

It is a gratifying fact that the percentage of adulterations in dairy and food products as compared with a long series of former years, shows a marked change in favor of pure food. To the honest and conscientious business man, much of the credit is due for the new and better era.

OFFICE OF DAIRY AND FOOD COMMISSIONER IS CONSTITUTIONAL.

In the recent Quo-Warranto preceedings instituted in the Supreme Court of Pennsylvania to test the constitutionality of the laws creating the office of Dairy and Food Commissioner of this Commonwealth, and to determine his right to perform certain duties, an opinion was delivered that is a signal triumph for the friends of the growing pure food movement.

The Supreme Court affirmed the legality of the laws. The Commissioner practically admitted that he was having analytical examinations of food-products made by reputable chemists, and that upon their recommendation, when articles of food were adulterated, misbranded or fraudulent, legal proceedings were brought against those selling such illegal goods, in order that their sale might be stopped and the health of the public safeguarded. This was done under the police powers that are vested in the several acts of Assembly creating the office, as well as defining the duties of the Commissioner. As stated in a previous report, ex-Commissioner Warren had courted the aforesaid proceedings, in order to still more clearly establish his own rights, as well as to add strength to his official work. The decision of the Supreme Court of Pennsylvania was a notable decree in favor of better health and less fraud. This decision is along right lines. There is absolute need for protection from food adulteration and fraudulent practices on the part of unscrupulous manufacturers. The reputable trade favors a rigid enforcement of the pure food laws, and declares that they are an emphatic success. A leading grocer stated that he had no idea how far away from decency the grocery trade had drifted in the matter of serving up goods that would sell, rather than goods that were wholesome and entirely suited to health. Manufacturers had evidently been blinding themselves to the real welfare of the consumer in their race to put out cheap goods that would sell best, bleaching, coloring, flavoring and preserving them until the danger and fraud brought about a storm of pure food legislation to stop the evil. It was this over-stepping of rights and proprieties that compelled a halt, and brought about the present rational adjustment, which means nothing more than that food products shall be sold as far as practicable as nature made them, leaving them with their natural flavor and color, and telling the truth on the labels under which they may be sold.

In many foreign countries, including Germany, France and others the most vigorous regulations are in full force for the prevention of the danger arising to the public health from the importation, preparation, storage and adulterated distribution of articles of food. He who makes an article cleaner, purer and better, whether under the compulsory conditions surrounding the enforcement of pure food laws, or through his own volition, is a public benefactor. It may require courage to do what is right, but the righteousness of the cause should appeal to all directly concerned, whether manufacturer, jobber or retailer.

SOPHISTRY OF CERTAIN FOOD PRODUCERS.

Perhaps the most striking feature of the latter-day sophisticator of foods is his rare knowledge of the requirements of both National and State laws, and his great skill in evading them. He is well aware of the careful tests that are being made by chemists, and to escape them or to mislead investigators, Nature and commerce are ransacked for new products, new methods and anything that will enhance the plans of the adulterator. Generally speaking, the pure food officials have stopped grosser forms of adulteration, and by a careful research and subsequent prosecution as each new evil was discovered, they have practically driven impure goods out of the State.

A peculiar feature of the office work has been its interesting and varied correspondence. While there is no valid objection to supplying all the information that is practicable, the tone of some of the letters show plainly the thinly disguised object the writers had in mind when framing certain inquiries. In other words, some of the correspondents desire expressions of opinion with a purpose of determining just how far they dare go without subjecting their goods to condemnation and themselves to prosecution. The line of demarcation is often too narrow for safety, and correspondents are advised accordingly. A copy of the act of June 1st, 1907, is invariably supplied in response to requests for information.

DUTY OF PRESERVING HEALTH AND LIFE.

The Board of Trade of the City of New York recently adopted a resolution that is far more expressive than the average book upon the same subject. The resolution reads as follows:

"Health and the protection of life are more precious to the people, and more necessary to their happiness than even the extension of our commerce, the fostering of our agricultural interests, the solving of our financial problems, the cheapness or efficiency of our postal service, the improvement of our rivers and harbors, or the enlargement of our navy."

Another publication reverts to the fact that over eight millions of our people living to-day will die of tuberculosis; that six millions of our present population will die of diseases of the heart and kidneys, and that of the same population, fully eight millions more will die of pneumonia.

It is also stated that during the past ten years the National Department of Agriculture spent forty-six millions in stamping out diseases of animals; in saving elm trees from the attacks of beetles; in warning farmers against potato blight; in exterminating some of the many ills and annoyances incident to agriculture, while the same government does not raise a hand to help the human family in combatting disease and death, excepting in the restriction of the manufacture and sale of adulterated articles of food and drink. The theme is one of paramount importance, and its contemplation reveals the need of such efficient co-laborers as the Pennsylvania Department of Health, the Dairy and Food Bureau recognizing their many opportunities for successful work for the public good.

CONVENTION OF NATIONAL AND STATE PURE FOOD OFFICERS.

Pennsylvania was well represented at the Eleventh Annual Convention of National and State Food and Dairy officials held at Jamestown, Virginia last July. The Commissioner of this State took part in the program of exercises. These representatives assemble annually to consider plans for the betterment of their work. This interchange of opinions has wrought a number of important changes and developed matters of the greatest importance and value to those interested in dairy and food laws and regulations. One of the principal matters considered is the question of securing a greater uniformity in laws and their interpretation and enforcement. Such action would end many annoyances, remove serious hindrances, and thus insure a greater purity of products throughout the country.

The meeting of these officials attract National attention, and they are growing in importance with each succeeding year. The enactment of a National Food and Drugs law has proven an additional stimulus for intelligent and active co-operation, and the few remaining states in the Union which did not have any pure food laws are now rapidly falling into line to advance the good cause.

Pennsylvania still stands at the pinnacle so far as the enforcement of pure food legislation is concerned, and will safely carry the guidon during coming campaigns.

PENNSYLVANIA LEADS IN DAIRY AND FOOD LAWS.

There are those who recall the sneers which were evoked by the suggested vigorous enforcement of the dairy and food laws of Pennsylvania; but to-day, there is hardly any one who is not willing to acknowledge their importance and usefulness and to pronounce them as a public benefactor. With the exception of our own excellent State Health Department, there is no other medium in Pennsylvania that contributed more towards the health of the people of Pennsylvania than this same Dairy and Food Division of the Department of Agriculture. The rational business-like policy in enforcing pure food legislation in Pennsylvania was one of the potent factors in fostering the new National Food and Drugs Act.

In his annual message to Congress, President Roosevelt expressed his hearty approval and support of the pure food laws of the Nation and states in the following emphatic language:

"Incidentally in the passage of the pure food law, the action of the various State food and dairy commissioners showed in striking fashion how much good for the whole people results from the hearty co-operation of the Federal and State officials in securing a given reform. It is primarily to the action of these State commissioners that we owe the enactment of this law, for they aroused the people first to demand the enactment and enforcement of State laws on the subject and then the enactment of the Federal law, without which the State laws were largely ineffective. There must be the closest co-operation between the National and State governments in administering these laws."

Secretary Wilson, of the National Department of Agriculture, Dr. Wiley, Chief of the Bureau of Chemistry, Prof. Bigelow of the same Bureau, and other National champions of the pure food movement, have at various times given their hearty and welcome words of encouragement and support to the Pennsylvania authorities.

HOW LAWS ARE ENFORCED.

The idea that the chief duty of this department of the public service is merely to supply information to inquiring people is a mistaken one, as it is also expected to make arrests where the laws are disregarded. The Dairy and Food Divisions has proven its devotion to its obligations and the numerous prosecutions brought in Pennsylvania were the result of flagrant violations of the laws. Manufacturers, jobbers and retail merchants have had ample opportunity to become acquainted with the simple requirements of the pure food and dairy laws. Needed information can be obtained upon application to the Dairy and Food Commissioner.

It was impressed throughout the State that the new and higher standard of food products which has been developed during the past few years must be maintained. There is not a single reason why the public should be permitted to become the victims of food adulterators, and with their past experience and knowing the meaning of the improved conditions, they are among the strongest supporters of the pure food agitation. Just what these changes mean in the matter of financial help and improved health is an incalculable asset. The proportionate cost to the citizens of the State has been singularly small, as the revenues paid into the State Treasury by the Bureau for a number of years past have considerably exceeded the expenditures of the Food Bureau.

NATIONAL AND STATE OFFICIALS MUST CO-OPERATE.

The Dairy and Food Commissioner of Pennsylvania, fully recognizing the truth that uniformity of laws and unity in their enforcement brings best results, desires to urge the special importance of a more close and intimate relationship of those entrusted with the enforcement of both National and State dairy and food laws and regulations. It is only by their concerted and well-organized efforts that the best results are obtainable. There are channels unexplored, and sources of adulteration and sophistry remain that can only be successfully reached after such a system of more direct and general co-operation is fully established. The signs of the times are propitious; the press and public are sympathetic and supporting the movement for better and pure dairy and food products; but there remains much to be done. So far as the Dairy and Food Bureau of Pennsylvania is concerned, it hereby extends an invitation to the officials of the Nation and State to ask for our assistance and co-operation whenever the public interests can be better subserved by such helpfulness.

NATIONAL VERSUS STATE PURE FOOD LAWS.

The Commonwealth of Pennsylvania has some of the best dairy and food laws of any state in the Union. No state was more largely instrumental in the passage of the Food and Drugs Act by the National Congress. After seventeen years delay, and after the exercise of many dilatory tactics, the present National law finally passed, but only in response to the rising tide of well-founded and popular impatience which became too persistent to be safely ignored.

The impression entertained by many intelligent people that the National law dispenses with State laws is, however, erroneous, and the Pennsylvania laws remain in full force. The National Food and Drugs Act applies to interstate business, and does not supercede our own legislation. It is still the opinion of the Pennsylvania authorities that the National law is altogether too broad and liberal in its scope, and that with its many defective points, there are State laws in force which are a far greater safeguard to the health of the people.

The National law includes drugs and medicines, as well as liquor, all of which articles are foreign to our dairy and food laws. Hundreds of correspondents wrote to this Bureau, making inquiries, while others desired serial numbers, etc., to be used on the medicinal and other productions. All such requests were transferred to the Department of Agriculture, Washington, D. C.

VALUABLE RESULTS OF ENFORCING PURE FOOD LAWS.

The experience in Pennsylvania in enforcing dairy and food laws has firmly confirmed the opinion that there must be a strong public sentiment back of the laws, if efforts to enforce them are to meet with any reasonable degree of success. This truth has been exemplified at various times during the history of this Division of the Department of Agriculture. In enforcing the laws, the public were educated in the plain truth that neither corporation nor individual was exempted, when such violators were discovered and brought to justice. While the number of prosecutions brought under the old pure food law seemed very large, yet, considering the magnitude of Pennsylvania's business interests and the number of people engaged therein, there was no indication that the general business atmosphere was laden with a greater percentage of dishonesty or lack of probity than perhaps existed elsewhere. The anti-adulteration law has been tried and not found wanting, and he who believed himself to be standing supreme and above the law, has been rudely undeceived when he was found to be ignoring his plain duty and the requirements of ordinary business sense and acumen. An effort to protect the food that goes on the table of the wage-earner and his family was of special consequence to the Dairy and Food authorities, and, therefore, as intimated, no class was spared nor punished at the expense of another.

While it is true that there should be additional legislation, it is also evident that the greatest evils have already been successfully restrained or curbed; but, as we have more experience, we comprehend increased needs, and still further, more stringent laws and more effective action.

That there has been a wonderful improvement in the quality and character of the dairy and food supplies sold in Pennsylvania, cannot be successfully controverted. The money advantage accruing from this work cannot be estimated, as the scores of fraudulent practices in the preparation and sale of some of the ordinary necessaries of life were startling in their aggregate proportions. The cordial support of the manufacturers and reputable dealers does not lack appreciation, as it made the work of enforcing the pure food laws practicable, while a united opposition of the manufacturers and press would not only have badly crippled the efforts for good, but made the attempt almost hopeless.

OFFICIAL FORCE PLEASED WITH HELP.

The official force of the Dairy and Food Bureau cheerfully and properly acknowledges the courtesy and good feeling that has been established between the officers and the trade throughout Pennsylvania. Several years ago, certain commercial interests were more or less inimical to the pure food work, but it is gratifying to report that all such imaginary barriers have disappeared, and that those perhaps most strongly opposed are to-day among its firmest supporters and friends.

The Special Agents of the Bureau who are constantly in the field, looking for violations of the pure food, milk, oleomargarine and other protective laws, recognize these improved conditions with much pleasure. There is a willingness upon the part of those concerned to assist in the enforcement of these laws that is very satisfactory, boding much good for the future.

FOOD PROBLEMS TO BE SOLVED.

Among the many all-important questions that are now being agitated by pure food authorities, are the following:

The use of sulphur in dried fruits and molasses.

The problem as to the use of benzoate of soda in ketchup, preserved fruits and fruit syrups.

The proper labeling of corn syrup or glucose.

The various questions involved are so far-reaching and the interests affected so extensive and valuable that the officials are inclined to give them every possible consideration, but no concession inimical to public health could be granted; neither will these officials permit the public to be imposed upon, through labels that misrepresent goods, or which claim merits and qualities that are entirely false, or absolutely misleading.

There is also no question as to the importance of deciding the various problems according to correct principles of business, but these decisions must not be such as to prejudice the interests of the consumer. The sale of both adulterated goods in Pennsylvania will not be permitted, and it is to be hoped that this matter will be fully and definitely understood.

THE MONTHLY BULLETIN OF THE BUREAU.

With the advent of a new State administration and the appointment of the present Dairy and Food Commissioner, there came a strong demand for a change in the publication of the Monthly Bulletin issued by this Bureau. It was determined that among the new features added, special stress should be placed upon its educational features. Under the direction of some of the best writers, the Bulletin has achieved increased success as an educator, and the publication to-day stands foremost amongst its class in the United States. The enactment and approval of the "Tustin Act," known as the new pure food law, and the repeal of the old and tried pure food law of June 36, 1895, opened a flood of inquiries for information which it was only possible to supply through the medium of the columns of the Bulletin. The manufacturers, jobbers and the retail trade in particular, have expressed themselves in commendatory language as to the benefits received through this medium of publicity, and all without any cost, whatever.

Each number of the Bulletin contains a variety of crisp, pungent and seasonable editorials upon subjects relating to the advancement of the pure food cause, while the laws and rulings adopted by the Bureau also receive publicity. In this manner the trade in general has an avenue for obtaining reliable and trustworthy information. In consequence of this gratuitous advice, no one need plead ignorance of the law, since an adoption of the information imparted will in most cases protect them against prosecution or financial loss.

The law makes the publication of this Bulletin mandatory, and its usefulness was never attested more fully than during the year just closed. While the grocers of Pennsylvania almost generally receive the Bulletin, those not receiving it can have their names and addresses placed upon the regular mailing list by writing and requesting it to be done. The press of Pennsylvania and trade journals are making liberal extracts from the Bulletin for the information of their readers, and if practicable, the publication will be improved during the coming year and made still more valuable and interesting.

Several other states are now disseminating information upon the pure food subject through similar publications, having observed its feasibility and usefulness. Pennsylvania long ago realized that publicity was an all-important accessory and helpful factor in fighting adulterated dairy and food products. The legitimate producer and retailer are unstinted in praise for the benefits received through the work of educating the public to demand pure, wholesome and genuine food products. The Bulletin can truthfully be said to lead all others of its class, both in point of practical information and circulation. It never contains any advertising matter, and no subscription fees can be accepted.

VALUE AND IMPORTANCE OF NEW LAW BULLETIN.

In the dissemination of information concerning the dairy and food laws of the Commonwealth, it was found necessary to compile and publish a new edition of such laws as are now on the statute books and in full force and effect. The same were printed in bulletin form (Bulletin No. 160), and including the appellate court decisions, comprise about 70 pages of material that is invaluable in the work of enforcing these laws.

Although the former editions included only the food and dairy laws, it was deemed advisable to add a digest or summary of the various appellate court decisions and opinions relating to oleomargarine, renovated butter, food and milk, which matter was included in the new publication. This additional matter has greatly aided the special agents, attorneys and others in the conduct of hearings, trials, etc. The specific laws and interpretations are plain.

The specific laws and interpretations are plain. These decisions and opinions clearly and concisely show that the legislature delegated the police powers that were needed in regulating food supplies; that oleomargarine cannot legally be served with meals without a proper license; that a guilty knowledge is unnecessary, and that serving oleomargarine unknowingly is no excuse; that agents for non-resident manufacturers must comply with such laws; that the State cannot totally exclude oleomargarine from sale within Pennsylvania; that the Pennsylvania law is not in conflict with the United States constitution; that both fines and imprisonment can be imposed upon violators; that courts can issue injunctions to restrain illegal sales of oleomargarine; that the sale of colored oleomargarine is illegal; etc., etc.

This compendium is therefore in great demand and worthy of more general circulation for the benefit of the trade.

A CONVICTED RETAILER HAS LEGAL REDRESS.

Under the provisions of the Pure Food Act approved June 1st, 1907, a defendant who has been convicted and fined for selling adulterated or unwholesome goods has legal redress. He can institute civil proceedings, and if he succeeds in establishing the fact that he bought the goods in good faith, and that he did not in any manner change their condition after their delivery and sale, the civil suit for damages and a repayment of the fine and costs paid will be permitted by the courts.

Section 8 of the aforesaid act reads as follows: "Any person who shall have been adjudged to have violated any of the provisions of this act, by reason of the purchase or sale of an article adulterated or misbranded within the meaning of this act, and who shall have purchased the article, so found to be adulterated or misbranded within the meaning of this act, under a guaranty from the vendor thereof, to the effect that the same is not adulterated or misbranded within the meaning of this act, or the act of Congress passed June thirty, nineteen hundred and six, shall have a right of action against the guarantor for the recovery of such damages as shall have been sustained by reason of such adulteration or misbranding; and such person shall, in addition thereto, be entitled to recover punitive damages; and such person shall further have the right to set off any sum or sums of money which shall have been instituted against said person for the violation of any of the provisions of this act, against any claim or right of action which the guarantor may have, arising out of the sale of the article or articles in question, or otherwise, and which shall include all expenses and reasonable attorney's fees."

This paragraph of the new law is attracting much attention, as it is a new feature of pure food legislation in Pennsylvania. That it is commendable and wise is generally believed by retail grocers, since it serves as an additional safe-guard to their interests. Under the old laws, it was perhaps purely optional for the manufacturer and jobber to compensate the retail merchant in case he was mulcted in a fine, but under the present law, there is ample redress.

RESPONSIBILITY OF EMPLOYES FOR VIOLATIONS.

Although the question of responsibility of employes in connection with the sale of oleomargarine, renovated butter and other articles of food has been raised in very many instances, the work of the Dairy and Food Bureau during a long term of years, has now clearly established that both the servant who actually sells, and the master who employs him, are equally liable to conviction.

This is an exception from the general rule in law that a master is not criminally responsible for the acts of his servant if done without knowledge, express or implied, though there is reasonable evidence of an expressed or implied actual or constructive authority on the part of the master, and he is therefore, as a general rule, liable. There are those who claim that the court should treat the master as the real offender, though taking no part in the offense and perhaps without any knowledge of it. The Dairy and Food officials have always carefully considered all claims of this nature.

If the master expressly prohibited a servant from doing a criminal act, and the servant nevertheless did it without the masters knowledge or consent, the liability could very properly be placed solely upon the servant; but these cases are so infrequent that they do not merit any serious discussion. As a rule, the Dairy and Food Bureau has experienced very little trouble in placing the responsibilities for transgressions of the law where they belonged.

MISBRANDING OF FOOD PRODUCTS FORBIDDEN.

The determination of the Dairy and Food authorities to enforce the law relating to the misbranding of food products and insisting upon an honest and truthful designation, is becoming better known to both the manufacturer and jobber. The proper branding of all such articles of food will be insisted upon, and a special effort to bring about this reform has already been inaugurated. Many of the more sensible and conservative manufacturers have already recognized the importance of changing their labels so as to meet the requirements of the Pennsylvania law, and they will thereby spare themselves the public odium, expense, mental anguish and annoyance that would follow prosecutions. Others will comply philosophically rather than willingly and cheerfully, after the annoyance of being prosecuted and compelled to pay fines and endure newspaper publicity and possibly criticism.

The National Food and Drugs Act, while requiring certain information from manufacturers, does not have any direct application to the Pennsylvania law, and in consequence a compliance with that law does not relieve any one from the requirements and responsibilities imposed by the State law. This matter has been explained at more or less frequent intervals, and the average manufacturer is therefore fully informed.

The people of the State are heartily approving this work, as it deals most effectively with an evil that should have been remedied many years ago. Counterfeit productions, if at all permissible, should not sail under false colors, and the old system of exaggerated and misleading labeling must be discontinued. One of the worst evils known to the trade has been the tendency to misbrand food products.

FOOD COMMISSIONER CANNOT APPROVE OR JUDGE LABELS.

Since the enactment of the pure food law, approved June 1st, 1907, the Dairy and Food Bureau has received hundreds of requests demanding that the officials should examine and pass judgment upon the legality of labels found on food products, etc. In the absence of any analytical knowledge of the contents of packages, and knowing that such an "opinion" would in most instances be used very freely for advertising or other improper purposes, it was found impossible to comply with such requests. In consequence of the frequency and persistency of these requests, the Commissioner recently promulgated the following circular letter of information:

"Rule 12—Numerous requests are referred to this Division for the approval of labels to be used in connection with food products under the Pennsylvania Pure Food Act of June 1st, 1907. This Act does not authorize the Dairy and Food Commissioner nor any Agent of the Division to approve labels. The Division, therefore, will not give its approval to any label. Any printed matter upon the label implying that this Division has approved it will be without warrant. It is believed that with the law and regulations before the manufacturers they will have no difficulty in arranging labels in conformity with the requirements set forth."

It is obvious that this is the only rule that can be safely followed by pure food authorities at this time.

STATUS OF IMPORTED FOOD PRODUCTS.

Inquiries have been made as to the status of imported food products that might be offered for sale in Pennsylvania. The Dairy and Food Commissioner has in all such cases held that although such articles of food may have passed government inspection, they are still subject to the approval of State authorities.

In case samples are bought from merchants whose business places are located within Pennsylvania, and upon analytical examination, such samples are found to be adulterated or deleterious to health, there is no hesitancy about instituting legal proceedings against the parties offering for sale or selling such unlawful products. If a package of such imported goods is found to bear a label that is misleading or illegal, it also comes within the scope of the authorities to institute prosecution.

The idea that imported goods are absolutely safe to handle because of their acceptance in a port of entry is erroneous and it therefore behooves the jobber and retailer to use proper care and vigilance. This regulation is the only one that can be safely pursued by food officials, since without watchfulness and care it would be a matter of but a comparatively short time until the Pennsylvania stores would be flooded with imported goods of at least questionable purity and quality. There is no discrimination against goods of a foreign make, but it must be understood that they shall be found to be on an equality with home products, and subject to a careful surveillance like our home products.

NO JURISDICTION OVER ADULTERATED LIQUOR.

Many correspondents of the Dairy and Food Bureau, presumably under the impression that this Bureau still had undisputed jurisdiction over the sale of adulterated liquor, as in the past, entered complaint and protests against the sale of such liquids by alleged unprincipled dealers in their respective localities. Under the adverse opinion of the Supreme Court in the oft-quoted case of Commonwealth versus Kebort, (adulterated liquor case), this office has no such power to interfere, no matter how gross or serious the harm or injustice perpetrated.

An act of Assembly passed and approved in 1863 provides: "That it shall be unlawful for any person or persons to make use of any active poison or other deleterious drugs, in any quantity or quantities, in the manufacture or preparation, by process or rectifying, or otherwise, of any intoxicating malt or alcoholic liquors, or for any person or persons to knowingly sell such poisoned or drugged liquors in any quantity or quantities; and any person or persons so offending shall be deemed guilty of a misdemeanor."

A feature of the act that makes it doubly difficult of enforcement would be the question of proving a guilty knowledge of the existence of such adulterant, when samples were secured from a retail or wholesale liquor dealer. When a manufacturer was charged with such offence, the proof would depend mainly on the analyst who examined the sample upon which the prosecution was based.

It is for these reasons that the Dairy and Food Commissioner is firmly in favor of additional liquor legislation.

A RATIONAL AND EFFECTIVE LIQUOR LAW NEEDED.

While the legislative session of 1907 produced some important and valuable legislation, it failed to enact the much needed liquor law that had been anticipated, and which seemed like a coming certain reality until during the last night of the session, when the worthy measure collapsed and failed of final passage. As the Supreme Court decided that the Dairy and Food laws did not provide for protection against the sale of impure, adulterated and poisonous articles of drink, the Commissioner has no jurisdiction whatever over such sales, and consumers use such stimulants at their own risk. Their only safety or guaranty lies in the standing and integrity of the dealer from whom they may secure their supplies; and even the reliable firm or individual may be imposed upon by the unscrupulous manufacturer or manipulator of liquor. Under these conditions, notwithstanding the National law now in force, "Compound Whiskey" is being sold without any special restriction, while other artificial and counterfeit liquor is also commanding a wider patronage than ever before, to the detriment of the health of the consumer.

The past year's renewed investigations of the quality of the soft drinks that are sold in such immense quantities in the larger cities has again proven their frequent unwholesomeness and adulteration. Saccharin, salicylic acid, coal-tar dyes, etc., are common constituent parts of such drinks. The miserable stuff that was sold by vendors at some military encampments as "lemonade," "orangeade,' etc., should also be driven out of the market because of its dangerous composition. The raids made upon such vendors at encampments had a salutary effect.

A rational and effective liquor law is an absolute necessity, and it can be truthfully asserted that no one will welcome it more heartily than the legitimate distiller, brewer and dispensing agent.

ALCOHOLIC "PATENT MEDICINES."

Commissioner Capers, of the Internal Revenue Bureau, Washington, D. C., has recently promulgated lengthy lists of certain alcoholic medicinal preparations which were analyzed by that Department, and because of their high alcoholic contents, classed as compound liquors under a special ruling. Because of this fact, druggists and others selling such compounds, must procure special stamps from the Revenue Agents. The Commissioner states that even though such sales may be made in good faith for medicinal purposes, the druggist must comply with the ruling and pay the special revenue tax.

In view of the strict ruling of the revenue officers, a number of so-called "medicines" have been withdrawn from the markets by the manufacturers, while in other instances the formulas were so modified that the classification was changed, thus making them comply with the law.

While the Dairy and Food Bureau of Pennsylvania has no jurisdiction over medicines and drugs, frequent complaints are received, alleging harmfulness, impurity, etc. The examinations made several years ago clearly proved that even some of the most common drugs fell short of the standard prescribed by the United States Pharmacopœia, and there was a surprising lack of uniformity of quality and strength. A singular revelation was the fact that certain drugs were just as likely to largely exceed as fall below the required strength, thus making them doubly dangerous for the patient for whom the questionable drug had been prescribed by the physician. More thorough and complete control is demanded for the safety and protection of the public.

PHYSICIAN'S VIEWS ON ADULTERATED LIQUOR.

"And what is it that the masses of our people are drinking?" asks Dr. John D. Quackenbos, of New York, in a diatribe on the drink habit, especially among women. "Anything and everything but pure whiskey, pure wine, pure beer. It is a poison far deadlier and more rapid in its action than the genuine articles. This fact is ignored by the temperance reformer and often by the physician. The consumption being greatly in excess of the ability of the brewers and distillers to produce wholesome beverages, notorious adulterations are resorted to.

"About 50,000,000 barrels of malt liquors represents the yearly output of the United States. Much of this, to meet the demand of the trade, is sold when new and imperfectly fermented, and a great deal of sickness is the result.

"The beer drinker of this country has to run the gauntlet of various preservatives, especially formaldehyde; its destructive action on all organs; of artificial bitters, like salicine, strychnia and aloes; of the well-known excito-motor picrotoxin, the active principle of cocculus indicus, which has narcotic or other stimulating properties, and is used to impart both bitterness and headiness; and of grains of paradise or malaguetta peppercorns, which give a hot, strong flavor and excite thirst, so that the more beer the consumer drinks the more he wants.

"Of every hundred drinks sold in the United States as whiskey to-day, only one is really whiskey, but so clever is the counterfeit that club connoisseurs have failed to detect it. Amylic ether, or the common 'whiskey' of trade, is the 'death's river' setting in resistless current towards murder, robbery, paresis and the asylum."

IMPURE DRINKS AND UNFAIR ADVERTISING.

The published report that fully eighty per cent. of the samples of "soft drinks," including "pop," were found to be adulterated, attracted wide-spread attention. The investigations made in Philadelphia, Pittsburg and other large places fully confirmed this statement. While the laws placed under the direction of the Dairy and Food Bureau do not include "articles of drink," the investigation had the effect of calling the attention of the public to this insidious evil. Salicylic acid, coal-tar colors, saccharin, and other illegal chemicals and drugs were found in abundance in such samples, but their sale goes on merrily and unrestricted, so far as the law is concerned.

On the other hand, a noticeable feature of the investigation was the wide publicity that brewers and distillers gave to the unfavorable reports affecting the purity of "soft drinks." They in turn advertised very freely, calling special attention to the purity of the beer found on sale in Pennsylvania, although just a few years ago, the conditions that were found in beer were almost equally as bad as those that are now so common to temperance drinks.

The Commissioner discountenanced misrepresentation as much as possible, but a few bold and unprincipled firms would persist in their claims of "absolute purity" and the "approval of the State authorities," when in fact, no such certificate of purity was ever issued to any producer of any article of food or drink, excepting through the regular channel of the Monthly Bulletin, issued by the Bureau for the information of the press and public.

This paragraph is inserted in all fairness to those who were inclined to believe that a special favor had been extended to competitors, as no discrimination is permissible.

EVILS OF THE COFFEE TRADE.

The pure food law was intended "to provide against the adulteration of articles of food, and to prevent deception and fraud in the sale thereof." The law, therefore, cannot tolerate the misbranding of coffee, whether sold as the pure, wholsesome berry, or when composed of a mixture of ground coffee, chicory, wheat, rye, peas, etc. The latter named composition would certainly not be included within the definition of an "ordinary article of food;" neither has any merchant or dealer a legal right to sell so-called "Java coffee" when it is not a native of that famed coffee producing district. This practice has been very common, indeed, and it is an abuse that was not unknown even in certain first-class business houses.

The glazing, coloring and other mechanical manipulation of whole coffee, whether during the roasting process or otherwise, is also more or less questionable in a legal aspect, and it is doubtful whether it can be justified. The glazing process is capable of abuse, since such coating must naturally make the coffee look better than it really is, while additional weight is also added. The object of this special treatment, coating, etc., might primarily be intended to protect the coffee grain against moisture and depreciation after roasting, nevertheless the practice has reached such a stage that the consumer and the conscientious dealer have been aroused.

THE SALE OF "COFFEE SUBSTITUTES."

The sale of cereal products as coffee substitutes, while still commanding a fair volume of trade, has been controlled to the extent that such substitutes are no longer being packed and placed upon the market under their former misleading aliases, but they are now generally sold for what they are. A few of the brands were found to contain a little true coffee, but for the most part they appeared to be made of parched grains of barley, wheat, etc., or of grain mixed with wheat middlings, etc. The claims of the manufacturers are usually to the effect that they make an unstimulating substitute for coffee, entirely harmless, and that it is difficult to distinguish it from the genuine coffee, while it is further declared to supply far greater nourishment at a much decreased cost.

That cereal coffees do not resemble the true flavor of the genuine coffee-berry is self-evident, and it is also true that no artificial coffee substitute has been discovered that can successfully replace the aroma and quality of the true coffee. Parched rye was used quite freely in country districts during the high price period that prevailed during the war, for a coffee substitute, and even through that period, the average farmer and consumer used it unwillingly, and only because of enforced economy. To-day, the coffee lover will insist upon having none but the best coffee, and will not tolerate the imposition of so-called "coffee-compounds" at abnormally high prices, nor without acquainting the consumer with the true nature and character of the goods offered for sale under a high-sounding name.

IMPOSITION PRACTICED IN SELLING TEA.

One of the many complex questions that has been brought to the attention of the Dairy and Food Bureau, is the alleged sale of adulterated tea. While it is probable that the lover of tea is quite frequently imposed upon by unscrupulous dealers who sell tea of an inferior brand and quality at abnormally high prices, the investigations made have not always proven any wrong-doing that justified proceedings under the dairy and food laws.

It has been suggested that the National authorities should take the initiative to bring about certain much needed changes in the importation and sale of tea; that a board of experts should be appointed by the Treasury Department, whose duty it should be to supervise such importations and adopt regulations that would more fully protect both the importer and retailer.

With improved conditions surrounding the tea market, and with the various classes and qualities more clearly defined and better known to the trade and consumers, there would very naturally follow a readjustment of values and selling prices and a consequent increased demand for the higher grades.

It is a well-known fact that in the mining and manufacturing districts of Pennsylvania where the bulk of the imported teas are sold by grocers, the demand is rather for the higher grade tea than for the inferior or cheaper grade; in other words, the miner and laborer wants a fair quality of tea and does not object to paying an equivalent price. Poor tea is not desired even at a low price.

MISLEADING NAMES IN COMPOUND GOODS ILLEGAL.

In a recent prosecution, a confectioner was charged with the sale of a so-called "chocolate" which upon analysis was found to contain less than 25 per cent. of chocolate and about 75 per cent. of starch or other matter foreign to the cocoa bean. The fact that it was sold under the distinct name of chocolate and branded as such formed a second violation of the new pure food act, but the magistrate, after being made acquainted with the extent of the adulteration, immediately imposed a fine of sixty dollars and costs, as provided by law.

In the consideration of this case, the decision of ex-Attorney General Elkin, relative to the sale of a "compound coffee," prevailed so far as the misbranding or misnaming was concerned. As the quantity of chocolate contained was so comparatively small, it could not be sold under that distinctive name, although marked as a "compound." The National food authorities have taken the same view of such adulterations and promulgated rules and decisions governing the subject.

For the purpose of cheapening cocoa and chocolate, starches of various kinds are ground in with the cocoa mass at the time of the introduction of the sugar, or with the cocoa after the expression of the fat. Although the adulterants may not be injurious to health, they not only reduce the nutritive value of the product, but the buyer is defrauded because of the material difference in the cost and value of cocoa and common starch. The manufacturers are recognizing the business and moral effect of pure food laws, and those who manufacture only the highest and pure grade chocolates and cocoas enjoy a larger patronage than ever before.

"BREAKFAST FOODS" UNDER INVESTIGATION.

Cereal products, or what are commonly known as "breakfast foods," are now receiving special attention at the hands of Dr. William Frear, an eminent chemist and leading authority on food products, with headquarters at the State College laboratory.

There has been a most marked increase in the number and variety of breakfast foods placed upon the markets of Pennsylvania, and the aggregate sales have reached large proportions. This is especially true in the several coal-fields of the State. The manufacturers spent money lavishly in their advertising campaigns, in some instances making most extravagant or exaggerated claims relative to the composition and nutritive values of such foods. While many of these brands really contain some of the advantages claimed, in nutritive ratios, taken as a whole, their cost is frequently excessive and disproportionate to their actual value.

In order that some intelligible basis of comparison might become available for the information of the public, samples of all brands found on sale in Pennsylvania were placed in Prof. Frear's possession for a thorough examination. It is probable that fully one hundred distinct brands of such "breakfast foods" will be reported upon in the near future, with a detailed statement as to his findings, including component parts, nutritive value, purity, etc.

There are diversities of opinion upon the results of such an exhaustive research, but the Dairy and Food officials of Pennsylvania place no credence in the alleged use of arsenic and other poisonous substances in the preparation of these foods. Just what special treatment may have been accorded may not be easy of determination, but if the brands obtained contain any harmful or deleterious substances, Dr. Frear will discover it and so report to the Dairy and Food Commissioner.

While these cereal products are wholesome and advantageous, and it is a matter of sincere regret that public confidence has been shaken by unfounded reports, it is equally deplorable that manufacturers should persist in foisting upon the public such grossly exaggerated claims as to their surpassing nutritive quantities. The press of Pennsylvania has repeatedly manifested its interest in the forthcoming bulletin, and it is hoped it may be available for public distribution at an early date.

If saw-dust, sand, hulls and woody shells were used in their manufacture, as has been alleged, the chemists of competitive manufacturers would not have been slow in making and announcing such discoveries. It is safe to assert that the Pennsylvania investigation of cereal foods now in progress will be the most complete and far-reaching ever conducted by any state in the Union. The question of proper branding will receive particularly careful attention during this examination into the merits of "breakfast foods" sold in Pennsylvania.

THE SALE OF CHEESE IN PENNSYLVANIA.

A few years ago, "filled cheese," as it was commonly known, was found on sale in Pennsylvania in considerable quantities. Later, the National law regulating its manufacture and sale, came to the relief of the public, while Pennsylvania closely followed with legislation forbidding its manufacture and sale in this State under heavy penalties.

In reply to the question as to what is "filled cheese," it might be explained that the material is made from milk from which more or less of the cream has been removed and some other fatty material substituted, the usual substitute for the cream having been neutral lard or some material prepared and, as intimated elsewhere, there is a strong possibility that the proper form was added to the cheese and seasoned in the usual manner. Such cheese practically became an "oleo cheese."

While the present cheese law of Pennsylvania is not just what is wanted by the legitimate cheese manufacturer and dealer, it is better than none, and there is no question as to the high quality of the cheese that is being sold in our stores. The laws of New York are more strict and far reaching, and as intimated elsewhere there is a strong possibility that the proper form of a "cheese act" will be formulated and presented for consideration at the hands of the coming Legislature.

The cheese makers of Pennsylvania have the material and resources to manufacture cheese second to none, and it is to be hoped that the Legislature will pass wise, protective laws governing this important branch of dairying. Pennsylvania-made cheese should always be synonymous with excellence and purity.

CHEMICAL PRESERVATIVES FOUND IN CHEESE.

It has been declared that the use of chemical preservatives in cheese is comparatively rare, if not entirely unknown by the cheese manufacturers of Pennsylvania. It is declared that the addition of a preservative to a cheese at the time of its manufacture would so seriously interfere with the ripening process as to actually defeat the purpose of storage altogether. The chemical preservative that might be introduced for a specific purpose would undoubtedly destroy the bacteria that are so essential in the ripening process.

The artificial coloring of cheese, especially those with a low fat content, is a serious matter, as many of the colors employed are alleged to be deleterious to health. Until the passage of the new pure food laws, the cheese manufacturer selected and used coloring matter to suit his own whim. To-day, if the coloring material is found to be deleterious, prosecutions are possible. The cheese in its natural color is universally acknowledged to be most palatable and most desirable.

COAL-TAR DYES IN FOOD AND DRINK.

Prof. C. B. Cochran, Chemist of the Dairy and Food Bureau, West Chester, has completed a series of important experiments upon colors in food products, and the results present some remarkable disclosures.

In a lecture delivered before the members of the Pennsylvania State Board of Agriculture, he exhibited a large assortment of samples of wool, which had been colored by the coal-tar colors, abstracted from various food products. Sufficient carmine coloring matter to color eight yards of woolen cloth was obtained from a small jar of artificial fruit jelly, showing the large quantity that had been used by the manufacturer. Scores of the samples of wool were highly colored by poisonous dyes that were removed from butter, jellies, candies, pie-fillers, wines, etc., many of the dyes being of great brilliancy. A sample of special interest was a jar of cranberries, because of its bright, red tint. Even huckleberry pie-fillers were deeply colored.

The Professor explained that the coloring matter was not employed solely to improve the appearance of the articles, but in many instances to aid in the deception of the consumer. In the case of the huckleberry compound, it was found to contain only a small amount of the genuine fruit, the rest being composed of a filler of unknown origin.

The wines and brandies so richly colored were not the product of any grape or fruit, but were counterfeit productions of harmful quality with the color added to simulate the genuine product. The use of dangerous coal-tar colors in the manufacture of butter was condemned in the strongest terms as being not only harmful but absolutely without justification. Vegetable colors, if any, should only be tolerated in butter.

At the last session of the Minnesota Legislature the lawmakers enacted an act prohibiting the sale of all food products, including butter, containing so-called "coal-tar colors." This law is to be enforced during the coming year in the strictest sense. The law, however, is somewhat peculiar because of the fact that it does not apply to any butter colored with the objectionable coal-tar dyes that may be manufactured for consumption outside of Minnesota. It positively insists that only vegetable colors can be used in coloring butter made for home consumption.

HARMFUL AND POWERFUL FOOD PRESERVATIVES.

While it is common knowledge that chemical preservatives added to articles of food and drink are detrimental to digestion, in even very small quantities, comparatively few realize their powerful and far-reaching effects upon the human system.

Salicylic acid is frequently found in wines, beer and other articles of drink, as well as in food products, and no fair minded scientific authority will be unwilling to acknowledge that its use for such purposes should not be tolerated. It is a great deal more powerful than benzoic acid in arresting the action of enzymes. It is said that one part of salicylic acid in 9.000 will stop the action of pancreatic enzyme, while it takes one part of benzoic acid in 2.600 to accomplish the same results. The use of formalin as a milk preservative is also acknowledged harmful and dangerous. It is said that one part in 7.000 will prevent fermentative action or souring, but notwithstanding this fact, dairymen and others will persist in its excessive use, because of its cheapness.

With the constant warfare that is being made against the illegal use of coal-tar dyes and chemical preservatives, by both the National and State authorities, it is to be hoped that their use will soon be discontinued in the manufacture of all articles of food and drink. Keen and health-giving appetites should be supplied with pure food—the kind that characterized the primitive life of pioneer days. The old, New England ideal of "plain living and high thinking," was, perhaps largely enforced by stern necessity; but it was an important factor for good that will live for centuries to come, although the manner of living was changed.

FORMALDEHYDE; ITS USES AND ABUSES.

Among the questions that are frequently developed in pure food court trials is that concerning the nature of formaldehyde, a preservative that was very commonly used by milk dealers several years ago. It was first prepared in 1868 by passing a mixture of air and methyl-alcohol vapor over heated platinum, and is still practically obtained only from the oxidation of methyl-alcohol. Its germicidal qualities were only discovered about twenty years later. It has a very powerful action on various forms of organic matter, and in practical medicine, formaldehyde to-day is only used as a disinfectant. Being placed upon the markets by manufacturers in various combinations, with proprietary or trade names, and sold to dairymen and milk-dealers, generally, its power for evil can scarcely be under-estimated. It was for this reason that the Dairy and Food authorities were determined to interfere with its improper use, and if possible, confine its use solely to the purposes for which it was originally manufactured.

Its cheapness of production was another factor that helped to swell its unwarranted sale for illegal purposes, and when sold under these aliases, it was especially profitable to the manufacturer and retail dealer, the latter perhaps not suspecting its real composition.

FORMALDEHYDE AS A MILK PRESERVATIVE.

The Dairy and Food Commissioner is greatly pleased to report that the crusade for pure milk in Pennsylvania has revealed a gratifying change in the quality of the milk supply, as compared with the conditions that prevailed several years ago. The common use of formaldehyde as a milk and cream preservative is no longer tolerated either by the State or municipal authorities. It is estimated that 8,500 samples of milk and cream were purchased in the open markets by the special agents of the Dairy and Food Division during the past summer and submitted to the official chemists for analysis. The analytical reports showed that less than a dozen milkmen were employing formaldehyde as a preservative, and these were promptly prosecuted and convicted of a misdemeanor and heavily fined. Its serious effects upon invalids and infants are too well known to require any extended discussion, while even the healthy individual cannot escape depression and consequent indisposition if the drug is used for several days. The United States Dispensatory refers to formaldehyde in the following language:

"It probably ranks in power as a little inferior to corrosive sublimate, although it is certainly much stronger than carbolic acid. It has a very powerful action on various forms of organic matter; one part in 4000 completely discolorizes wine, precipitating extractive and coloring matters. Upon the higher animals it is one of the most irritating substances known. Formaldehyde is much used for the preservation of human bodies; an injection of one per cent. solution usually suffices, the body in a dry room, rapidly hardening without decomposition."

During the trial of an important milk adulteration case in a neighboring court, Prof. Cochran, Chemist of the Dairy and Food Bureau, said under oath, that one part formaldehyde in 7,000 would be sufficient to prevent milk from souring. As the average dairyman has no conception of the strength and dangerous character of this awful stuff, he is inclined to use it recklessly and freely, thus greatly augmenting the danger to human life. This is especially the case where he obtains possession of the solution at a low price, although in many cases the article is sold in packages retailing at one dollar for a quart bottle while the contents may represent only from 7 to 10 cents worth of the drug, the balance being nothing but water.

If the Dairy and Food Division had not done any other work than to look into the milk supplies of the various sections of the Commonwealth, the people would have been fully compensated for the few thousands of dollars expended in securing these changed conditions. Dairy products should always be pure, and the press of the State and consumers in general are demanding that such shall be the rule, in language and terms that cannot be misunderstood or mistaken.

PRESERVATIVES AND COAL-TAR COLORS IN CATSUP.

Within recent years there has been established a demand for "condimental sauces" which is unprecedented. The term applies to catsups, pickles and the numerous array of miscellaneous sauces which are to be found on sale in every first-class grocery or delicatessen shop. These goods are very generally colored and chemically preserved. While the prudent housewife will produce and keep such products for home consumption in their original purity, the manufacturer who caters to the grocery trade will insist upon the use of benzoic acid, benzoate of soda or salicylic acid and added coloring matter in their preparation. This questionable rule has been in vogue so long that many manufacturers thought they could not dispense with these foreign ingredients. Several of the largest manufacturers, in compliance with the changed sentiment, discarded the further use of coloring materials and chemical preservatives, and are now preparing and shipping many of their products in small packages that had been carefully sterilized, while the quality of the goods, has also been greatly improved.

In other cases, the manufacturers attach labels to the packages, certifying that the contents "are artificially colored," and that they contain "one-tenth of one per cent. of benzoate of soda." Purchasing at random, and in different sections of the State, many of the leading brands of catsup were placed in the hands of our official chemists for analysis. It was found that nearly two-thirds of the samples of catsup tested contained more than double the amount of the preservative indicated by the label on the package. This development was surprising to food authorities, generally, and as the consensus of modern expert and medical testimony is unfavorable to the continued use of chemical preservatives, even in the minimum quantity named under the rules of the Federal government, it is safe to assume that when double the quantity is introduced into the human system, the result cannot be otherwise than doubly harmful.

Knowing how rapidly the evil effects of drugs and chemicals will become intensified by repeated usage, the Dairy and Food Commissioner directed that prosecutions should be brought against dealers who sold such harmful and falsely labeled food products. Under the rules of both the State and Federal food authorities, the use of one-tenth of one per cent. of benzoate of soda was but tentative, and subject to revocation at the end of the present year.

Just what action the Federal government will take upon this palpable violation of both laws and rules remains to be seen. So far as Pennsylvania is concerned, the question is answered fully and plainly by the prosecutions already commenced and about to be instituted for similar offences. The Dairy and Food Bureau has won a signal victory in the cases brought for using such excessive quantities of benzoate of soda in catsups, scores of prosecutions having been terminated upon the payment of the fine and costs by the defendants.

SULPHUROUS ACID IN FOOD HARMFUL TO HEALTH.

That the work of the Pennsylvania Dairy and Food Bureau in making an extended investigation into the use of sulphurous acid in food products, and the consequent numerous arrests ordered, was entirely justifiable, is plainly evidenced by the following paragraph from a bulletin issued by Dr. Wiley, Chief of the National Bureau of Chemistry, Washington, D. C.:

"The relations of sulphurous acid to health are perhaps of greater importance than those of the preservatives already studied—namely, boron compounds and salicylic acid and its salts. The reason of this is found in the fact that the use of sulphurous acid at the present time is more general, and in certain classes of food products, according to the statements of manufacturers, more nearly approaches a necessity than is the case with boron or salicylic acid compounds.

"Sulphurous acid in some form is extensively employed in many technical operations in the preparation of foods. This is especially true in the production of wine, in the preparation of evaporated or dessicated fruits, and in the manufacture of molasses. The problem presents itself under two aspects—namely, the use of sulphurous acid or its compounds for technical purposes in the preparation of foods and its application to the finished product as a preservative."

While the Pennsylvania laws may conform with the National food and drugs act so far as practicable, it is freely admitted that the use of this preservative is adverse to the public health and good, and especially if sulphurous acid should be consumed for any period of time in connection with our regular daily dietary. The initial work performed in Pennsylvania attracted attention throughout the nation.

ANALYTICAL RESEARCHES BY STATE CHEMISTS.

During the past year the several chemists in the employ of the Dairy and Food Bureau made extensive researches into numerous practical problems that are constantly arising in connection with a vigorous enforcement of the pure food laws. At the State laboratory, located at Harrisburg, Prof. Loomis made an exhaustive investigation of the color question and the report on coal-tar colors has since been printed in bulletin form by the National Department of Agriculture. Among the various products that were the subject of special inquiry, might be mentioned breakfast foods, candies, ice cream, glucose, canned goods, catsups, etc., with the result that many valuable items of information were made available for the use of the State and National authorities.

An important and far-reaching subject, meriting special attention, was the common use of sulphurous acid and sulphites in various products, both for bleaching and preservative purposes. Reference to this phase of the work is made in another paragraph. That the National Department has taken up the work begun in this State on the misuse of sulphurous acid, forms its own commentary, and attests to the wisdom of the fight against its illegal use.

There is no other state in the Union where more thorough and careful attention is devoted to the examination of the milk and cream supplies than in Pennsylvania. The number of samples analyzed was far in excess of that of any preceding year. The researches into dairy products were exceedingly satisfactory, and a decreased number of prosecutions tells the story better than ordinary words.

It was recommended in a previous report that the State laboratory should be equipped with the paraphernalia necessary for making complete bacteriological examinations of milk, water and food products, but the requisite instruments have not yet been made available. The bacteriological chemist to-day occupies such a conspicuous part in the analytical world that each succeeding day and month only emphasizes the need of securing these increased and most desirable advantages for the service of the Department of Agriculture, at the Harrisburg laboratory. With the aid of analytical, microscopical and bacteriological information, the work of the Dairy and Food Division would not only be greatly enlarged, but the public in general would be vastly benefited. All of this innovation could be added without any great cost to the Commonwealth. Many of the leading and progressive dairymen of Pennsylvania would hail this innovation with special pleasure.

EXPERT FOOD CHEMISTS IN DEMAND.

The increasing attention that is being paid to the investigation of food products on the part of both National and State authorities has created a demand and opened a new field for an increased number of proficient and expert analysts of food products. The long experience of the chemists employed by the Dairy and Food Bureau of Pennsylvania was well known to the National authorities, and as a result, Prof. H. M. Loomis, formerly engaged in food analytical work at the State laboratory, located at Harrisburg, was offered and accepted a responsible position under the direction of Dr. H. W. Wiley, of the National Bureau of Chemistry. He is at present in charge of the Galveston, Texas, district. In several other cases the chemists of the Bureau are actively engaged in assisting the National government in making special examinations and researches into food products, a work that is regarded as of mutual advantage. It is the intention of the Pennsylvania authorities to co-operate in every manner in work that will improve the pure food supply of the State and Nation, and the experiences of the past year justified this decision, by reason of the good results attained.

With thousands of analyses made by our chemists, it is but a tribute of fairness to say that in no single instance has there been any charge of unfairness or gross error on the part of any of the numerous parties directly concerned in food analyses. In no state in the Union was a greater volume of analytical work performed, and the general results are therefore all the more gratifying to the officials responsible for the difficult task.

NO JURISDICTION OVER DRUGS AND MEDICINES.

The requirements of the National Food and Drugs Act are frequently confounded with the food laws of Pennsylvania, and the Dairy and Food Bureau receives many scores of letters from correspondents, including druggists and physicians, who ask for further enlightenment. Such letters are usually referred to the authorities in charge at Washington, or the several State boards having local jurisdiction. The manufacturers of patent or proprietary medicines are particularly interested in the new medical law, and as illegal branding was far too common, its enforcement will be not only very desirable, but resultant of much good. The order issued by the Commissioner of Internal Revenue, Treasury Department of the United States, requiring dealers in certain patent medicines to pay a revenue tax as liquor dealers, also brought many letters of inquiry. This order has no connection, whatever, with the Dairy and Food Bureau, so far as Pennsylvania is concerned, and the revenue license was demanded by the National officials, because certain so-called "medicines" contained but very little substances whose properties were medicinal, but such large amounts of alcohol as to make their use as intoxicants not uncommon, as well as dangerous to a certain class of patients.

Another subject of inquiry came from patients who used "head-ache powders." This matter is also outside of the jurisdiction of this office, but those immediately concerned have a right to know more about the different degrees of toxicity in the use of these drugs which have such potent physiological effects upon various persons. Many brands of "head-ache" powders cannot be regarded otherwise than extremely dangerous.

The medical fraternity are best qualified to pass upon these questions, but the public should be safeguarded, as it is known that many of these "medicines" have a most depressant effect.

Although always willing to co-operate with the proper authorities in charge of the laws regulating the manufacture and sale of so-called "patent medicines," the Dairy and Food Bureau of Pennsylvania has no legal jurisdiction over such products. Judging by the number of letters received by the Bureau, it is evident that the notion prevails that anybody and everybody has the right to compound, bottle, label and sell (or give away) to the public such "patent medicine." The wrappers and labels in very many cases are of such a laudatory character as to give physicians a feeling of disgust. Pharmacists and physicians who are familiar with certain compositions declare that their capacity for evil is far greater than is ordinarily comprehended. It has been suggested that a board of examiners of well-known standing and practical knowledge should be appointed to pass upon the formulas that are used in the manufacture of such medicines, and that in this manner much deception and possible injury to health, could be avoided.

The present magnitude of the problem was entirely unforseen at the time the National Food and Drugs Act was formulated. The requests for information received by the Pennsylvania Dairy and Food Bureau serve as a criterion of the need for a closer supervision over the sale of such articles. The clamor for such protection against nostrums is not a sensational one, but is founded upon a desire to protect the public against imposition and actual injury.

GLUTEN FLOUR SUBSTITUTES AND ADULTERATED DRUGS.

A correspondent of the Dairy and Food Bureau made inquiry concerning a certain brand of gluten flour which had been sold to him as a patient suffering with diabetes. Its use was strongly recommended because it was claimed that it was exceedingly low in starch contents, and therefore especially suited for persons suffering from this disease. It is said that in at least one instance, a sample of alleged "pure vegetable gluten" sold by a reputable druggist under his own name at 50 cents a pound, upon careful analysis, was found to contain 60 per cent. of starch—the substance which of all others the diabetic patient is paying a high price to avoid. The chemist declared that the spurious sample was grossly misleading, inasmuch as it was nothing more nor less than whole wheat flour sold at 50 cents a pound.

The Dairy and Food Bureau received many other letters asking for information relative to the purity of various articles that are usually found in drug stores, and which are sold under special names and for a specific class of sufferers, but on account of the limited appropriation available, it was not always possible to purchase samples for analysis. Where no definite information could be supplied by the Dairy and Food Bureau, the letters of inquiry were referred to the Secretary of the State Pharmaceutical Board for his consideration and reply.

The adulteration of drugs is a subject that is closely allied with the study of pure food in its various phases, as it is apparent that food and drugs are closely allied, and that whether sold by the grocer or the druggist, there is a connecting link that can be made prolific of much public good. It is well, however, that drugs do not come under the jurisdiction of this Bureau, but under separate and distinct control.

FORM OF GUARANTY SUGGESTED.

The subject of a proper form of guaranty required by retailers from jobbers is an interesting one. A proposed form was promulgated by the Dairy and Food Commissioner, but this was only tentative and intended as a guide to the prudent and careful merchant. The Tustin Pure Food Law is specific as to its requirements, but does not include any set or prescribed form of guaranty. This is a matter that rests with the dealer who is to seek self-protection, in case illegal goods should be foisted upon him. There is no dealer who may not have use for such guarantee during his relations with the jobbers who supply the retail trade with food products.

In the administration of the pure food law of Pennsylvania, the Commissioner is anxious to furnish all possible information to the trade, and where a proper form of guaranty is presented, and a willingness shown to place the responsibility where it properly belongs, it will serve as a valid defense; on the other hand, such guaranty must be absolutely faultless in its form and meaning, while the party in possession of illegal goods, proven such by chemical analysis, must show when and from whom such merchandise was obtained under such guaranty. It is, therefore, essential that every invoice should bear a guaranty, signed by the firm shipping such goods, and the purchaser must also be fully prepared to not only identify such goods, but prove date of purchase, etc., and the fact that they are the article or articles upon which prosecution was recommended. For the information of those concerned, the following form of guaranty has been suggested:

"We, the vendors of the articles mentioned in the foregoing invoice hereby guarantee the same to be in full conformity with the Federal Pure Food and Drugs Act of June 30, 1906, and also guarantee the same to be in full conformity with the Act of the General Assembly of Pennsylvania known as the Pure Food Act, approved June 1st, 1907, in that the said articles are not adulterated or misbranded within the meaning of the aforesaid acts."

This can be written, or placed upon the invoice with a rubber stamp, or printed, and when legally signed and dated, it will be considered as a satisfactory form, so far as the Pennsylvania pure food authorities are concerned. The National government may prescribe a different form, but the guaranty required by the Washington authorities applies only to that department of the public service, and does not hold good in this Commonwealth.

The Attorney General of the United States recently decided in the case of a District of Columbia dealer who was cited for a hearing on the charge of selling an adulterated food product, and who held a guarantee from a Maryland dealer, that he had a sufficient defense, and upon further investigation, it was ascertained that the Maryland merchant in his defense, and as a matter of information, produced a guaranty from a Pennsylvania manufacturer who had delivered the adulterated goods to him. Under these conditions and the provisions of the National Food and Drugs Act, approved June 30, 1906, the Attorney General gave the opinion that the only legal solution was to confiscate the adulterated goods and destroy them, in case any remained on the shelves of the District of Columbia purveyor. The Tustin Pure Food Act reads as follows so far as the subject of guaranty's is concerned:

"Section 8. No prosecution shall be sustained under the provisions of this act, for the selling or offering for sale, or having in possession with intent to sell, any article or goods, as defined herein, when the same is found to be adulterated or misbranded within the meaning of this act, when the accused can establish a guaranty, signed by the person residing in the United States from whom such article was purchased, to the effect that the same is not adulterated or misbranded within the meaning of this act, designating it or within the meaning of the 'Food and Drugs Act,' June thirtieth, one thousand nine hundred and six enacted by the Senate and House of Representatives of the United States of America, in Congress assembled: Provided, however, That if the article in question is in a broken or open package, said guaranty shall not afford immunity from prosecution, unless such person shall furnish satisfactory proof that the article has not been changed in quality. The affidavit of such person shall be accepted as such proof and the person making such affidavit falsely shall be guilty of perjury, and punished accordingly: And provided, moreover, That every person giving a guaranty under the provisions of this act shall be held responsible for the adulteration or misbranding of any article or goods sold under said guaranty, and shall be subject to the penalties for the violation of the provisions of this act.

"Said guaranty to afford protection shall contain the name and address of the person making the sale of such articles to such dealer, and, in such case, the said person shall be amenable to the prosecution, fines, and other penalties which would attach, in due course, to the dealer, under the provisions of this act, when said articles are found to be adulterated or misbranded. Provided, That no such guaranty shall operate as a defense to prosecution for the violation of this act, if the dealer shall continue to sell after written notice by the Dairy and Food Commissioner that such article is adulterated or misbranded within the meaning of this act."

FORMULAS NEED NOT APPEAR ON LABELS.

Among many manufacturers there was a mistaken idea prevalent that under the restrictions imposed by the pure food laws, they would be required to make public their private and valuable formulas, and thus open to the world, a free and untramelled manufacturer's outlet for their respective productions, no matter how valuable or dearly bought such formula may have been.

The same misunderstanding prevailed elsewhere, but so far as Pennsylvania is concerned, the Dairy and Food Bureau announced that the law does not compel the formula to be given on the label, but requires only that the articles comprising such formula shall not be in violation of the pure food law.

While it is mandatory to sell pure, harmless and unadulterated food products in Pennsylvania, the rights of producers are regarded as private just so long as they do not make themselves amenable to the law.

Where a manufacturer places upon the market an article that is fraudulent, unwholsesome or injurious to health, the result of such analytical examination becomes public property. When a prosecution follows such analysis, the facts are made public, and no attempt, whatever, is made to shield the defendant; in fact, publicity through publication, is even a better preventative of wrong-doing then the mere imposition of a nominal fine.

While neither weaklings nor practical extremists could be successful as pure food agents, the Commissioner points with much pride to the unswerving integrity, tact and ability that was displayed during the many ordeals that confronted the employes of the Bureau during the past year. It is always when a new law is invoked to secure certain improved conditions, that we are compelled to cope with new and unexpected difficulties which, happily, were met with satisfaction, and a proud measure of success.

WHAT THE NATIONAL GUARANTEE DOES NOT MEAN.

As might very reasonably have been anticipated, manufacturers of food products, liquor, patent medicines, etc., have grossly abused the privilege accorded to them in connection with the stamping upon their respective productions a serial number and the statement that the food or drug is "guaranteed under the food and drugs act, June 30, 1906."

With clevelry worded advertisements, some of the unscrupulous manufacturers are endeavoring to delude the public into the belief, through the medium of deceptive labeling, that the printing or marking of such serial number upon a package implies that the same are "guaranteed by the United States Government," or that "the United States Government new Pure Food and Drugs Act guarantees our products." These unjust representations have aroused a strong protest against the manner of labeling goods, and as a result, the National Department of Agriculture has called a halt and threatened to expose those who are guilty of making such false claims. While the Department allows manufacturers to file a general guarantee, it assumes no responsibility, whatever, but merely attaches a serial number in order that the responsibility can be placed where it belongs, in case of trouble or wrong-doing.

It is remarkable that some prominent firms should have been found guilty of abusing the confidence of the government authorities. Their advertisements were so palpably unfair and unjust that the authorities were compelled to take official action in order to protect both the public and themselves against this chicanery.

NO APPROPRIATION MADE FOR FREE ANALYSES.

The erroneous impression is still prevalent throughout the Commonwealth that the Dairy and Food Bureau should make analytical and bacteriological examinations of foods, drugs, patent medicines, as well as many other articles that are submitted for that purpose, without any expense to the party submitting such samples. This subject has been discussed in previous reports. While the Bureau will do all that lies within its power to render services to the people of Pennsylvania, neither the appropriation available nor the chemical laboratory facilities would be sufficient to meet such demands. Its present resources are hardly sufficient to meet the expenses occasioned by making examinations of the samples forwarded to the several laboratories by the sworn special agents of the Department. If the resources were larger and such analytical examinations could be made, it would not only be an obvious wrong to examine at public expense samples in which perhaps only a shrewd manufacturer or prejudiced individual might be interested; but, such reports would ultimately be used for advertising purposes, if favorable, and consequently abused by being represented as the official endorsement of the Dairy and Food Bureau. Where samples were sent in by the sworn agents for analysis the reports are public property; but otherwise such analyses could not possibly be made for the information of an individual.

WHEN DUPLICATE FOOD SAMPLES ARE REQUIRED.

At various times there has been a misunderstanding on the part of dealers and others regarding the law which requires the sworn special agents of the Dairy and Food Bureau to buy samples intended for analysis in duplicate. The only statute demanding the duplication of samples is the new pure food act approved June 1st, 1907. It does not require that the duplicate should be sealed and left with the party from whom the sample was obtained. The law makes it mandatory that the one sample shall be forwarded to the official chemist of the Bureau, and the other sample is to be delivered to the office of the Dairy and Food Commissioner, to be kept in reserve in case a re-test should be demanded during the trial or before the legal termination of the case. The statutes do not require that agents should purchase or obtain duplicates of samples of perishable goods or food products, such as milk, cream, butter, oleomargarine, ice-cream, etc., for obvious reasons.

In but a single instance since the new pure food act went into effect has the duplicate sample been called into practical use. This was in connection with a retest of a certain brand of ketchup, in which 20-100 of one per cent. of benzoate of soda was reported by the chemist. The re-test not only confirmed the correctness of the preceding analysis, but a composite test of the same article by two prominent chemists showed that the sample contained 22-100 of one per cent. of the preservative. The legislature alone can regulate the manner of procuring samples, and the Commissioner must follow its mandates.

THE ICE CREAM SUPPLY OF PENNSYLVANIA.

Under a ruling promulgated by the Dairy and Food Commissioner, "ice cream must be true to name and contain not less than 12 per cent. butter-fat," together with sugar and pure fruit flavor. Eggs and a small amount of gelatin are also permissible in its manufacture. Other objectionable ingredients will not be allowed. While many of the conscientious dealers have already manifested a willingness to comply with this ruling, a large proportion have not yet changed formulas or methods of manufacture. As some prosecutions have already been brought, it is fair to assume that ice cream must be improved in standard and quality. The use of so-called "mechanical" preservatives is frequently urged by those who desire to keep ice cream for an indefinite period, claiming that without the addition of gelatin, gum tragacanth or agar-agar, it will not retain its homogeneity or "stand-up," without causing the marginal icing that occurs when it is kept in storage. On the other hand, it is important to know that when ice cream is kept beyond a limited time, the uncooked milk and other ingredients, even if kept under refrigeration, will commence to decompose, and possibly form toxic products. Then it may become a serious menace to health.

Any practice involving the prolonged storage of such a perishable product cannot be healthful or safe. To place the product before the consumer at the earliest practicable moment following its manufacture is the only safe and satisfactory plan that we can advocate.

Fair warning is given that the manufacturers of ice cream must elevate their standard, and also pay more attention to sanitary matters. Leading manufacturers may soon be willing to sell their ice cream under a guarantee as regards butter-fat contents. This plan would undoubtedly attract the discerning trade who want the best obtainable and who do not question the price. In other words, the price of the ice cream could very readily be gauged by the butter-fat contents; that is, fix a definite price for cream containing twelve, fourteen, eighteen or twenty per cent. butter fat, according to its richness and quality.

In the examinations made into ice cream, few samples were found to contain chemical preservatives, such as formaldehyde, boric acid and saccharin. The use of gelatin in small amounts and certain gums and starches was attested by chemical analysis, but in general, the conditions were pronounced as being better than those that existed several years ago, when good, pure and rich ice cream was far less common than to-day.

The "hokey-pokey" vendors have also changed some of their formulas, although their product is too frequently a compound of milk, sugar, uncertain flavor, questionable dyes and still more doubtful cleanliness. The ice cream question will need further consideration when the Legislature meets, and the best representatives of the trade will co-operate in framing proper laws to regulate its manufacture and sale.

A CRUSADE FOR PURE OLIVE OIL.

Olive oil has become a very important article of food in Pennsylvania, and in some sections it is almost as popular in the daily dietary as in the countries of Southern Europe. While principally employed in making the various forms of salads, there are also many hundreds of people who consume it regularly for medicinal purposes.

The fact was brought to the attention of the Dairy and Food Bureau that the ordinary purchaser of salad or table oil presumed that he was receiving olive oil, and that the terms "Olive Oil" and "Salad Oil" were synonymous with most purchasers and consumers. The cheapness of cottonseed oil and its similarity in appearance to olive oil presented a wide opportunity for deception and fraud, and as a result, the officials made a thorough investigation. It was soon discovered that cottonseed oil was not only placed on sale in the bottles which resembled the peculiar form adopted by the largest producers and importers of the genuine olive oil, but it was also proven that the best brands were closely imitated by external appearances by the simulations of labeling, etc., of imported and high priced oils. The cottonseed oil was also sold in tin cans of various sizes, bearing laudatory foreign markings, alleging purity and high quality, with many fictitious names of producers, but almost invariably selling at about the same prices as the genuine article.

As these chemical examinations continued, the number of prosecutions for the sale of fictitious or adulterated olive oils increased. In the cities of Philadelphia and Pittsburg, the Italian grocers were especially conspicuous violators of the pure food laws for selling bogus olive oil, while some of the larger stores were also mulcted in fines and costs.

The investigation has completely changed the olive oil business, and to-day, cottonseed, table and other substitutes for olive oil are to be found in the markets of Pennsylvania, but they are properly branded and sold for what they are. On the other hand, there has been created an increased demand for the pure product of the olive, and it is no longer impossible to obtain olive oil that is genuine, pure and worthy of the name and at a proper price. Many physicians have commended this phase of the past year's work of the Dairy and Food Bureau most highly, since their patients required the highest grade olive oil, and heretofore experienced difficulty in obtaining the desired article.

FOREIGN OLIVE OIL PRODUCERS DECLARE FOR PURITY.

The Dairy and Food Division of Pennsylvania has been informed that as a result of the numerous prosecutions brought in this Commonwealth during the past several years for the sale of adulterated and spurious brands of so-called "pure olive oil," and because of the more drastic laws of the Federal government, the Spanish olive oil producers, at a general meeting held at Madrid, Spain, decided to suppress the mixing of other oils, such as cottonseed oil, etc., with olive oils intended for the export trade. To aid them in attaining the end sought for, they have asked their government to grant an export duty on olive oil. They further considered the advisability of establishing technical stations in New York, Japan and the South American republics, in order that their interests might be best conserved and protected, and further fraud prevented.

In connection with this important action on the part of the Spanish importers, it is worthy of note that the gigantic movement to stop the sale of adulterated and counterfeit olive oil originated in the City of Philadelphia, where the evil had assumed singularly large proportions. It was especially great among the foreign importers. The investigations showed that the practice was even larger and more common than had been suspected. The labeling of cottonseed oil with foreign labels, whether in tin cans or in bottles, purporting to be the genuine and imported brands of olive oil, was misleading and quite common. The goods contained in such packages were not only a base counterfeit, but the seller thereof was equally guilty of selling illegally, consisting of cottonseed oil or cheap substitutes, because of the additional charge of false representations and mislabeling.

PURE SUGAR SOLD FOR DOMESTIC PURPOSES.

With the enormous amount of sugar that is being sold and consumed, some citizens still believe this product is subject to adulteration. In several instances correspondents of the Dairy and Food Bureau called attention to what they regarded as violations of the law, supposing that the sugar purchased by them from retail grocers was not commercially pure, and asserting that wheat flour or some other form of adulterant had been added to cheapen the sugar and increase the profit of the manufacturer.

As all the sugar sold and used for domestic purposes has been refined, any gross adulteration of the raw material would have been detected by the manufacturer. In the investigations made by this Bureau, there is nothing on record to show that the analytical examinations made from time to time resulted in the discovery of a single flagrant violation of the law. In fact, the refined sugars sold in Pennsylvania for household use are amongst the purest of all articles of food.

While there is a greater possibility of finding adulterations in powdered or pulverized sugar, it is worthy of note that these, too, were found of a uniform good quality and purity. It has been reported, however, that one extensive manufacturer of confectionery, purchases the best brands of granulated sugar and pulverizes it as it may be needed, thus securing additional protection against any attempt to adulterate. The coloring of sugar continues, but there is no attempt to commit fraud, only to secure a greater uniformity in goods.

SULPHITES IN GLUCOSE AND CONFECTIONERY.

Those who are keeping informed as to the work done in Pennsylvania, will recall the inhibition of the use of sulphurous acid or of its salt, sodium sulphite, in any food product. The analytical reports indicated its use even in abnormally and unnecessarily large amounts in corn products, dried fruits, beer and also in confectionery, where it was especially harmful since young children partook of candy freely—consumers, who, as we fully realize, were all the more susceptible to its baneful influences. These sulphites were an unnecessary part of the glucose which formed the base of many of the cheaper grades of candy. The hundreds of prosecutions brought by the Dairy and Food authorities of Pennsylvania aroused strong protest, but the result aimed at has been largely attained. The so-called "glucose trust" is now supplying candy manufacturers and others with glucose that is entirely free from sulphurous acids and sulphites.

It is asserted by those who are well qualified to judge that the continual use of sulphites produces an unfavorable symptom in the health of the body. With a combination of the numerous preservatives and antiseptics employed in food products, and the fact that some of them are of the accumulative type, is it any wonder that the public entered an appeal for help to combat the growing iniquity?

The United States government authorities are now engaged in making a scientific examination into the molasses and can syrups of Louisiana and other sugar cane-producing sections with a view of determining what effect, if any, the change in the method of manufacture would have on such products. So far, the molasses lacks only the difference in color; that is, it is no longer being bleached with the aid of sulphites, and consequently is of a slightly darker color. The evident intent in using this objectionable material was simply to please the eye, since it could not possibly add anything to the quality of the food product in which it was used. The same experience will apply to glucose. The National Confectioners' Association of the United States and the confectioners of Pennsylvania in particular, have declared against the manufacture and sale of any confectionery containing deleterious materials of any kind. In the formulation of the present pure food law, commonly known as the "Tustin Act," their co-operation was both helpful and acceptable. They are unalterably opposed to such harmful ingredients, poisonous colors, etc., and in more than one instance called attention to some of the more flagrant short-comings. Of course, they also recognize the fact that it is somewhat difficult to establish any fixed standard for certain goods, but it is to their credit that they are continually aiming for a higher standard.

LEGAL STATUS OF GLUCOSE IN PENNSYLVANIA.

The agitation concerning the subject of glucose containing sulphites attracted widespread attention not only in Pennsylvania but throughout the United States. Numerous correspondents made inquiry as to the legality of this product in the Pennsylvania market, and its status can be best defined by the explanation that when pure and free from foreign and deleterious substances, it can be regarded as a legal commodity. The word "sugar" according to a standard definition, is a "sweet crystalline compound derived chiefly from the juice of the sugar-cane and sugar-beet." This definition identifies sugar as the substance known to chemists under the name of cane-sugar or sucrose.

The subject of inquiry, namely, commercial glucose, is an entirely different product, and not even "grape-sugar," as many advertisements of some manufacturers strongly intimated in order to attract trade and advance their pecuniary interests. Glucose is a product made by the action of acids on starch, and as analysis shows, it is of somewhat indefinite composition, always containing in addition to reducing sugars, dextrine, water, traces of starch, etc. The average tradesman and consumer understands well enough what is meant by sugar, and the substitution of commercial glucose for it is not tolerated nor warranted by law.

One of the features of the enforcement of the pure food laws of Pennsylvania is the gratifying fact that the reputable and leading manufacturers of jellies and jams who are now doing business in Pennsylvania, will use only cane-sugar for sweetening and preserving.

As an outgrowth of the glucose crusade, there has been created a large and substantial demand for pure syrups, and to-day, the old and uncertain mixtures sold as "pure cane syrups," although largely, if not entirely, composed of glucose, are rarely found in stores.

IMPROVED QUALITY OF FLAVORING EXTRACTS.

The ingenuity of flavoring extract manufacturers in the years when pure food laws were in their infancy surpassed comprehension. While it required skill and pure materials to produce good goods, it is probable that there was more time and ingenuity exercised in the production of adulterated and inferior goods than in the making of genuine and legitimate flavoring extracts.

The importance of the subject required some drastic legal action on the part of the pure food authorities, but the effort was compensated by excellent results. To-day, the two best known flavoring extracts sold in our market are vanilla and lemon, and it is safe to assert that but few, if any, of the old imitations are now to be found on sale, excepting under their proper name and designation. The examinations made indicate that there is a more general compliance with the pure food law by extract manufacturers, and that the inducements for an increase of profits by substitution and adulteration are largely diminished through the vigorous enforcement of the law.

As a solvent, wood alcohol was often used in the manufacture of extracts, its use being the more reprehensible from the fact that scientific knowledge had made it possible to eliminate the disagreeable woody odor that characterizes it. This alcohol is a deadly poison when used in excessive quantities, and hence the prompt and vigorous action of the food authorities was imperative.

A careful examination of the analytical reports published in the Monthly Bulletin will show the marked decrease in the adulteration of flavoring extracts, and that artificial and adulterated goods do not have the standing of former years, when the public were less exacting and lacking the information that now enables them to discern pure goods and to buy wisely.

CHEMICALLY PRESERVED COD-FISH.

The modern system of "quick-curing" resulted in the prosecution of a large number of retail dealers who sold cod-fish, because of the fact that such fish, upon analysis, were found to contain large amounts of illegal chemical preservatives. Under the so-called "quick-curing" plan, salting and smoking had largely disappeared, as the fish were most frequently cured in brine, and preserved with the help of borax and other forbidden chemicals. That the product appears more attractive to the eye and more palatable may be acknowledged, but there is no question as to the harmfulness of these practices. It is therefore worthy of mention that the more recent analyses of samples of various samples of cured fish purchased in different sections of Pennsylvania show very conclusively that the system of "doping" such products has been abandoned, and that better and more wholesome substitutes are being sold to the consumer. As the working people are the largest consumers of this kind of food, they are benefited in a corresponding degree in being able to get a better and more nutritious fish diet than ever before at no increased cost.

The hundreds of suits commenced in Pennsylvania for the sale of adulterated fish attracted general attention throughout the United States, and the work commenced here is now bearing fruit in other states, where similar action against the sale of chemically preserved and adulterated fish in now in progress.

PURE SPICES IN PENNSYLVANIA.

The most satisfactory results have followed the enforcement of the pure food laws, so far as the sale of adulterated spices is concerned. The analyses made by the chemists at the several State laboratories are showing uniformly good reports as to the purity of the spices now on sale in Pennsylvania, as compared with the deplorably large number of adulterations which were found during similar investigations several years ago. These samples of pepper, cinnamon, ginger, allspice, etc., were obtained from grocers and dealers in all parts of the State. This gratifying fact was not brought about without a vast amount of work and very many prosecutions, but to-day, spurious spices are rarely found on sale, and impure goods have been diverted into other states where the laws may perhaps be less severe and not so rigidly enforced.

The purveyor of adulterated spices long ago discovered that the markets of Pennsylvania were no longer profitable. Disregard of the law cost such persons, as well as the retailers, a large amount of money, but the new era of pure spices is hailed with genuine satisfaction by the trade and consumers, generally. A determined Dairy and Food Commissioner and a court of justice were the factors that brought about the change for the better.

There was a time when consumers regarded the drug store as the only safe place where pure spices were obtainable; too frequently they paid fabulous prices. To-day, the word of a reputable grocer is sufficient and will go just as far as that of the druggist, and as a result, the spice trade is an integral part of the business of both the grocer and druggist, and with pure goods practically assured, the regular grocer need no longer fear any competition.

PURE CHOCOLATE AND COCOA.

The examination made into the purity of the numerous brands of chocolate and cocoa found on sale in the stores of Pennsylvania, has demonstrated the pleasing fact that consumers are now experiencing but little trouble in finding pure goods. Several years ago, a similar investigation showed that adulterations were frequent, and that consumers were paying exorbitant prices for brands that were regarded as pure, but which contained a high per cent. of starch or material foreign to the cocoa bean. The substitutes for cocoa or chocolate cost only a trifling part of the genuine material, and in consequence the fraud offered opportunities for a marked gain for the manufacturer.

Potato and wheat starch were common adulterants, while corn starch was also used more or less freely in defrauding the consumer. Comparing the price of wheat flour with pure chocolate, the reader can readily figure the chance for gain. The removal of a portion of the fat from chocolate was also practiced. This constitutes an adulteration.

Whether chocolate or cocoa is sold as pure or as a compound, the consumer should exercise due caution so as to avoid being imposed upon. The use of cocoa and chocolate by invalids, and especially when recommended by the medical fraternity, makes pure goods a necessity in order to supply the best nutrient. The prosecutions brought against violators of the law several years ago have had a salutary and lasting effect, and it is safe to assert that its moral good has reached far beyond the confines of Pennsylvania.

UNFAIR SUBSTITUTION OF FOOD PRODUCTS.

One of the many matters brought to the attention of the Dairy and Food authorities is the growing habit of many dealers of substituting articles of food for others of "equal value," as is usually claimed. This evil is a widespread one, but the Dairy and Food Bureau has no legal authority to interfere. If goods of an illegal character are substituted, and the facts are adduced through the regular legal process, the dealer is amenable to the law. On the other hand, the remedy that is most easily applied is for the customer to insist upon having that article which he demands. Without taking into consideration the relative value of the article displaced and that of the article recommended as a substitute, the business principle is not a fair one to the consumer, and consequently he is justified in complaining, whether or not suffering financial loss.

Some of the leading trade organizations of the State have registered their protest against the evil of substitution, believing that patrons have rights which should be respected and that if they do not have in stock the goods demanded, an explanation should be given, and the purchase of a substitute be left entirely to the discretion and judgment of the buyer.

IMPOSITION IN SELLING STORAGE EGGS.

While it is true that jokes relative to the sale of cold-storage eggs have become almost as stale as the "hen-fruit" proper, there remains no doubt as to the attitude of the Dairy and Food Division upon the subject of imposing upon the consumer as choice, fresh eggs, stock that is of entirely unknown vintage, and unfit for food. The evil has assumed such large proportions that former references appeared in the publications of this Bureau, appealing for remedial legislation at the hands of the Legislature, but without any tangible results.

In many sections of the State, merchants are now equipped to store large quantities of eggs, and as the stock is collected and placed in cold storage when prices are at the lowest ebb and retained until the market reaches the zenith in price, it is unloaded at very considerable gain. So far as the local demand for such stock is concerned, it is usually very limited; consequently the eggs are consigned to the city markets where they are only too frequently sold to the unsuspecting consumer as fresh laid eggs and at correspondingly high prices. Some dealers will not knowingly deceive their patrons, but some plan should be devised whereby storage eggs might be readily distinguished by marks and dates, so that even a child could buy intelligently and escape deception, annoyance and financial loss.

It is for this special reason that remedial legislation is again earnestly recommended. Never in the history of the State have eggs commanded a higher average figure than during 1907.

BETTER LARD LAW NEEDED.

The Lard Act now on the statute book was approved June 8th, 1891, and provides that lard sold as such must be the pure fat of swine, and wholly derived from the fat of swine. Lard that does not comply with this requirement must be sold in packages or wrappers on which is plainly marked on the outside in letters not less than one-half inch in length, the words, "Compound Lard." This act has not fully met all requirements, and certain changes will be recommended when the Legislature again convenes.

While the illegal sales of compound lard as pure lard are less frequent than at any previous period, there is no doubt but that in isolated sections, this imposition continues. Wherever a consumer has a good foundation for the belief that the law is being violated, the matter should be reported to this Bureau.

The plea that it was almost impracticable to handle and sell pure lard during the warm season is not well founded, and there is no reason why the housewife should not know what quality of lard she is buying—whether it is the pure fat of swine, or the combination of various lard substitutes under an alias.

Because of the faulty construction of the present lard law, many former prosecutions were brought under the Pure Food Law approved June 26, 1895, and invariably carried to a successful termination, whether tried in the county courts or before magistrates. A stronger and more drastic law is a necessity, however.

THE APIARIES OF PENNSYLVANIA.

The honey producers of Pennsylvania have reasons for rejoicing because counterfeit and adulterated honey is no longer to be found on the shelves of the grocers. Several years ago, the adulterated article was extremely common, as our chemists' reports proved, and only too frequently was sold as the genuine product of the honey-bee. The Dairy and Food authorities kept up an incessant warfare upon the fraud until the spurious substitute was entirely driven from our State. The proper labelling of honey has also been helpful, and the strong criticism made against the illegal sale of counterfeit goods has brought forth good results, and pure honey. The apiary in Pennsylvania brings to the owners a large amount of money, and the aggregate value of the honey produced, sold or consumed in the State is surprisingly large, because of the increased interest and greater possibilities for gain.

The bee-keepers have an effective organization, with the leading apiarists enrolled, and taking an active interest in all matters that can advance their cause. They hold regular meetings, and may be regarded as one of the many organizations that will be a strong ally of the department of Agriculture in its praiseworthy ambition to help all branches of industry.

SELLING "SHUCKED" OR "OPENED" OYSTERS.

The markets of Pennsylvania are supplied with large quantities of so-called "opened oysters," and as they deteriorate rapidly after being opened and exposed to the air, there are natural suspicions as to their true condition and purity.

The investigations of the Pennsylvania Pure Food Bureau demonstrated the fact that formaldehyde and boron compounds are occasionally used as a preservative, contrary to law, and that "shucked" oysters are "floated" in order to improve their appearance. The "floating" process is performed by soaking them in water, and by the addition of alleged harmless chemicals, but it is none the less to be rebuked and discountenanced by the legitimate dealer. These processes are reprehensible and it is worthy of note that they are far less common than formerly. It is to be hoped they will be entirely discontinued. It is urged that the consumer living near the source of supply should demand fresh shelled oysters, while those residing at distant points should exercise the utmost care.

Prosecutions have been brought at various times against dealers and peddlers who sold chemically preserved oysters, but, as already intimated, the practice of selling such illegal goods has almost entirely vanished and better conditions are in vogue throughout the State.

GROWING USE OF COMMERCIAL "PIE-FILLERS."

Although it is generally acknowledged that the fresh domestic pie is probably the only one which, for sanitary and other reasons best known to the housewife, should be placed on the table, there is an increasing demand in the larger cities for the so-called "pie-fillers" which are manufactured and sold to bakers and others in large quantities. While many samples subjected to examination were found to be of more or less uncertain composition, it was also discovered by the chemist that the use of artificial colors of questionable healthfulness and chemical preservatives was more or less frequent.

These "pie-fillers" should be supplied to those who desire them in a pure and wholesome condition, and without the addition of harmful colors or preservatives. Under proper conditions they have a legitimate existence in the kitchen and bake-shop; but it is unwise and unlawful to foist upon the public food that will not bear critical examination. Because fruits, ordinarily, are plentiful and of comparative cheapness, and condiments and spices of good quality are also readily obtainable, there is no real, valid excuse for a continuance of the imposition.

BETTER SANITARY CONDITIONS AND CLEANLINESS.

The Dairy and Food Commissioner has referred to the need of keeping a closer watch over the sanitary condition of bakeries, ice cream plants and confectioneries, personal observations having forced the conclusion that rigid inspections are necessary in order to produce the best effects. The filthy conditions that formerly prevailed at many such places were deplorable, because inimical to public health.

In some of the larger cities of the State, the environment of certain places where candies and ice cream, as well as so-called "soft drinks" were sold to children and others, were intolerably filthy and uninviting. It is to be regretted that in many cases the character of the goods that were exposed for sale were equally uninviting, unwholesome and dangerous.

While the factory inspectors are empowered to inspect bakeries, there are other shops where improper sanitary conditions exist, and where active measures to abate the nuisances are in order. In the case of dairy and food products of whatsoever description, cleanliness, goodness and wholesomeness are handmaids. The physical defects mentioned can be eliminated and should be for the protection of public health.

PURE, CLEAN ICE RECOMMENDED.

The matter of pure and clean ice and ice supplies for the dairy and the farmers, generally, is a question that is increasing in importance with each succeeding year. Under the administration of the State Health Department, and in connection with city and borough regulations, it is gratifying to know that the question of the purity and wholesomeness of ice supplies is receiving far greater consideration than ever before. Sanitary engineers and consumers formerly seemed to regard the subject of purity as of only secondary importance. With the demand for the best and purest dairy products, pure water and pure ice are inseparable.

The preliminary experiments made show that while natural ice formed to a reasonable depth is comparatively pure, such supplies may be contaminated if the water freezes to the full depth of the usual shallow pond on the farm, or if the pond be flooded by surface water, collected from adjoining fields.

There are dangers associated with the gathering and storage of natural ice which merit serious thought, as was evidenced by the investigations of the Vermont Experiment Station, which pronounced a number of samples of pond-ice entirely unfit for household use. While perhaps the greatest influence in the self-purification of ice is the effect of a low temperature upon the vitality and life of bacteria, it would be unwise to disregard cautionary measures.

Local authorities in a number of sections of the State forbade the gathering and use of ice on certain streams and ponds, because of unsanitary conditions that prevailed, when certain parties interested wrote to this Division for advice and permission to continue its unrestricted use in the dairy and for household purposes. As the local health officers had already passed upon the question, and being on the ground and perfectly familiar with the conditions that made such negative action necessary, it was impolitic for the Dairy and Food authorities to venture an opinion, except to urge a strict obedience to all regulations that were intended to conserve public health.

The opportunities afforded for ice infection during the distribution of what is commonly regarded as "pure ice" are many, consequently too much care cannot be exercised. Ice men handling the ice, infection from the air of our boroughs and cities, dirt and filth from pavements and streets, dirty brooms, filthy water used for washing ice, hands and feet of laborers handling or cutting ice, the hoofs of horses, drainage from fields adjacent to ponds, these and scores of other dangers will always confront even the careful and cleanly ice-man. Regulations for securing a natural system of purification of our ice supply are worthy of our careful thought, especially since the demand for ice is steadily growing and its uses multiplying at a remarkable rate.

Every modern and progressive dairyman and farmer should have a liberal supply of pure ice, and he must not sacrifice health and life for the sake of escaping a slight burden consequent to obtaining ice of purity and quality.

SHORTWEIGHT PACKAGES COMMON.

In addition to guarding the people against the illegal sale of compound lard as the pure fat of swine, there should be some easy method of stopping the sale of short-weight packages. An investigation proved conclusively that the evil above referred to is far more common than is supposed, as it was found that the lard sold in packages and pails did not always contain the weight indicated on the package. In some instances packages were one-half pound short. Other firms furnish full weight packages, and have the same properly labeled. It is alleged that competition had brought about the short-weight practice, but nothing can extenuate such a serious offence. The same shortcoming applies to other food commodities, as the correspondence received during the year will conclusively prove. In short weight packages the consumer almost invariably is charged about the same price that should be paid for an honest full-weight package.

To prevent such impositions upon the public, and to make the work truly effective, a special law governing the subject should be passed, making violations a misdemeanor and providing heavy penalties. Such packages should be properly labeled, with actual net weights specified, so that even a child could buy the article intelligently, and without any fear of being the victim of dishonest practices. Some of the large department stores were among the first to call attention to the imposition practiced upon an over-confiding public through the medium of short-weight packages of lard.

INFORMATION RELATIVE TO MUSHROOMS.

One of the peculiarly interesting experiences of the past year was the correspondence and personal visits of parties who were in quest of information relating to this edible fungi. Unfortunately such inquiries could only be referred to the National authorities at Washington, D. C., as the subject of mushrooms is foreign to the pure food law, excepting when sold in canned form. From the earliest history, mushrooms have been extensively used as human food, and to-day the mushroom growing industry is becoming not only extensive but a source of much profit to the experienced grower.

Dr. Wiley, of the National Bureau of Chemistry, laid down the following general hints:

"Favorable signs. Pleasant taste and odor, peeling of the skin from rim to centre, pink gills turning brown in older specimens, solid stems, stem easily pulled out of the cap and inserted like a parasol handle. The fungi should be gathered in the morning."

Some of the canned mushrooms analyzed was chemically preserved and very inferior in quality, although sold at a high price.

STATE CONTROL OF MANUFACTURE AND SALE OF TOBACCO.

While England, Scotland and Ireland are enforcing certain laws governing the manufacture and sale of tobacco, this Commonwealth has no special restrictive law relating to the subject, notwithstanding the immensity of the tobacco trade, excepting that the sale of cigarettes to minors under a specified age is illegal. It was the purpose of a prominent member of the Senate during its recent session to present an act that would prohibit some existing evils, but it was abandoned until the next session.

Foreign laws prevent the manufacturer or retailer from using other liquid than water in tobacco, and parties selling or sending out goods not made according to the provisions of the act are subject to fine of 200 pounds and forfeiture. For cutting, coloring, making or possessing leaves, etc., to imitate or to be used in tobacco, is declared illegal and subject to the same penalty. There is no reasonable doubt but that some of the manufactured tobacco sold is harmful, because of the coloring process, bleaching and other chemical treatment to which it is being subjected. The Senator referred to the complaints that had reached him, and acting in entire good faith, he will introduce the proper bill when the Legislature reconvenes. His proposition was to place the act under the jurisdiction of the Dairy and Food Bureau. That the use of drugs and chemicals should be prohibited is self-evident, no matter how general and common the practice.

"PURE FOOD STORES," "SANITARY DAIRIES," ETC.

That the repeated crusades against impure food and adulterated milk have proven prolific of much genuine good is attested by the so-called "Pure Food Stores," "Pure Food Restaurants," "Sanitary Dairies," "Sterilized" and "Pasteurized Milk Stations," etc., that are now in evidence in almost every town and city, whether large or small.

A visit to some of the principal streets and business thoroughfares of any city will conclusively show that there is a strong sentiment for pure articles of food and drink, and that those who cater to such demands of trade are receiving the bulk of the patronage. These results are perhaps due mainly to the enforcement of the drastic law of June 26, 1895, which has been repealed. The act of June 1st, 1907, was substituted. As the new law has been operative for but a comparatively brief period, its real worth and utility are less known than that of the old and obsolete act, but it is believed that with a few important changes and amendments at the hands of the next Legislature, it will be more satisfactory and effective than at present.

The indications are that with the experience of the past year as a guide, there will be but little if any trouble in securing the co-operation of the retailers, jobbers and manufacturers in formulating laws that will be simple, more easy of enforcement and adequate to reach all violators. With a feeling of greater cordiality existing between retailers, jobbers and manufacturers, resultant of the pure food law agitation, there is no valid reason why these interests should not be merged, and all effort concentrated upon a law that will afford mutual protection to all, including the consumer, who invariably suffers the greatest wrong.

BENEFITS OF PURE FOOD SHOWS.

A natural sequence of the pure food movement, primarily instituted in Pennsylvania, has resulted in the holding of numerous so-called "Pure Food Shows" in the larger cities of the State. As in most instances the local grocers' organization is responsible for the initial movement in holding such exhibitions, they are attended by large crowds, anxious to obtain instruction or entertainment. One of the prominent features at some of these "shows" is to give a series of lectures or talks upon culinary and other subjects by those thoroughly competent to instruct and entertain, thus adding to the general interest of the show. As an advertising medium, many manufacturers distribute samples of their products, realizing that in this manner they can reach the family and kitchen more quickly and directly than through any other source. The quarters or exhibition space allotted to exhibitors are usually sold at the bare cost, as the main idea involved is not to make money, but to establish a still greater degree of confidence and a pleasant and intimate relationship between the grocer and consumer. That this object has in many cases been attained was made evident by observations at several of the larger shows.

Being comprehensive in its general scope, educational in its aims, highly impressive in its importance, and combined with a wealth of decorations, and eye-opening in its revelations concerning the modern grocery store and its possibilities, the Dairy and Food Division is happy to encourage such evidences of a unity of purpose and a greater concentration for the mutual good of both the purveyor and consumer. The country apparently was ripe for these large and instructive pure food expositions as independent institutions, when properly organized and judiciously managed. The pure food shows that are being held in New York, Chicago, Boston and other large cities have become almost National events in their scope and importance.

PENNSYLVANIA GROCERS' ORGANIZATIONS.

The session of the organization of Pennsylania grocers held at York, Pa., demonstrated most forcibly the pleasing fact that the days of unreasonable, acrimonious and bitter business rivalry, and the consequent sacrifice of legitimate bargains of profit, have passed into oblivion. To-day, the numerous borough and city grocers' associations are working together with the State association as a harmonious whole, and their power and influence are felt and appreciated.

The Dairy and Food authorities recognize in these associations a potent ally for good, as in a majority of cases, the officers are always anxious to assist in the enforcement of the pure food laws, and opposed to the selling of impure, adulterated or deleterious food products. They have also learned that the public are discriminating, and that to-day, the average housekeeper is more interested in learning about the good qualities of the goods she may purchase, than in knowing how cheaply she can buy inferior, adulterated goods. It is a question not as to how cheap, but as to how good the article can be produced and sold to the fastidious consumer.

The program arranged for these gatherings of live, progressive and independent grocers include the best talent and most progressive ideas that have been evolved by long years of fruitful experience. Some of the addresses and papers read at the York meeting attracted National attention, having been reprinted in all of the leading and influential trade journals in Pennsylvania and other states. The intellectual and social features of these meetings are most edifying and beneficial, and each succeeding meeting will be awaited with pleasant anticipations. By their concerted action and an expressed willingness to co-operate in the enforcement of the pure food laws, the influence exerted has been helpful in an extraordinary degree to all members and participants.

HELPFUL TRADE ORGANIZATIONS APPRECIATED.

The Pure Butter Protective Association, of Philadelphia, the Retail Grocers' Association, of the same city, and the Pittsburg Retailers' Association, have again merited the praise and thanks of the Dairy and Food officials for their hearty support of the dairy and food laws. The educational propaganda inaugurated by these strong organizations has been particularly valuable and helpful. It was found in the first place, that to secure an observance of the laws, an educational campaign was necessary. This was carried on largely through the influence and appreciated help of various trade officials and their associations. The results of their work are everywhere encouraging, and it seems reasonable to expect that in the future our labors will be better understood and aims more readily accomplished than in the past experimental stage when grave doubts and misgivings were too often retarding factors.

The new National Food and Drugs Act is still in the crucible, while the Tustin Pure Food Act of Pennsylvania is also being tried, but there is no evidence that these laws will not be accorded a careful and proper administration on the part of the officials concerned. On the other hand, with the promised co-operation of such leading and prominent organizations, there is no question as to the mutually beneficial results that will naturally follow.

Oleomargarine and renovated butter are legalized by commerce through National legislation, but states have the right to place certain restrictions regulating their manufacture and sale within their respective borders. Inter-state commerce will in a degree affect certain food products, but as the improvements contemplated by legislation are generally regarded with favor by the honest and scrupulous manufacturer and jobber, there can no longer be any doubt as to the final triumph for pure food and dairy products.

HOW GROCERS HAVE ORGANIZED.

One of the beneficial effects of the crusade against adulterated food has been the hearty response that was made in the effort to unite grocers in active organizations for the promotion of their mutual interests.

The Philadelphia Retail Grocers' Association is one of the best examples of such organization, and with a membership comprising over 700 of the leading retail grocers of that city, it has become an influential and powerful auxiliary in the gigantic grocery trade and commercial interests of Philadelphia.

Their Secretary, William H. Smedley, a conservative but very efficient executive officer, is responsible for the success which has characterized every movement of this large organization. The system of co-operative buying instituted by the advice and help of Secretary Smedley commenced on a small scale, and after it was once inaugurated, it soon developed into an actual necessity. There is no doubt that this movement is a very popular one, and the membership are loud in their praise of the success of the experiment, because, as one of many advantages, it has in a great measure, already eliminated the fierce competition of cutters.

CONFECTIONERS' SUPPORT PURE FOOD LEGISLATION.

With the National Confectioners' Association subjecting its members to control, and the United States Brewers' Association pledging its hearty support to the pure food movement, there is much encouragement for those advocating and enforcing the statutes, whether of National or State legislation. Both of these organizations have stood by the laws since their enactment, and they desire that no kind of adulteration should be practiced nor permitted, but sternly discountenanced. These associations further declare against adulteration, whether the same was injurious to health or affecting the purse of the consumer; they denounce any form of deception or fraud upon the consumer, and at their meetings, have passed resolutions supporting these statements. They are not satisfied with preventative measures only; they desire and strongly urge that punitive measures be applied in any case belonging to this category of adulteration. Under the administration of these strong and energetic organizations, the counsel and help extended to their members should exert a far-reaching and excellent effect.

The Dairy and Food Bureau appreciates such friendly help, and ventures the opinion that in no manner can the members of these active organizations receive greater benefits than by accepting the principles which they advocate; for those who will wilfully violate the laws despite such warnings, do not reflect credit nor honor upon the organizations whose privileges they have abused.

COUNTERFEIT AND MISBRANDED CHOCOLATE CANDY.

One of the evils found in the confectionery trade has been the use of paraffine, umber and other substitutes in the manufacture of so-called "chocolate" goods. Certain confectioners employed paraffine wax, together with a brown coloring material, which, in some cases, was found to be brown umber, and thus deceived the innocent buyer into believing that he was getting pure candy at a cheap price. In other cases, the manufacturers would not designate them as chocolate, but simply as chocolate colored goods. This did not excuse the offense, and consequently the pure food authorities were obliged to stop these practices through the process of prosecutions for violations of the pure food laws.

The National Association of Confectioners is organized purposely to prevent the use of harmful adulterations or ingredients in the manufacture of confectionery, and the members are willing to assist the pure food officials in driving out of the market spurious and harmful confectionery. They claim that their main object is to stand together for greater purity of products, knowing that increased patronage can only come through the sale of pure goods.

Letters from Philadelphia, Pittsburg and other places referred to the sale of cheap candies which caused death or the illness of children, and these complaints received the prompt and careful attention of the special agents of the Bureau. In no single instance was it proven that such death or illness was entirely due to the use of adulterated or poisonous candy. The complainants erred in the diagnosis of the real trouble. It is but fair to make this statement, because of the misleading newspaper reports which have appeared from time to time, and to present this Bureau in its proper light.

VINEGAR LAWS OF PENNSYLVANIA.

Gross misconception existed among fruit growers and farmers concerning the actual requirements of the law regulating the manufacture and sale of pure apple or cider vinegar. A circular letter was promulgated interpreting the statute. Farmers who make cider from the pure fruit-juice and label the same with the name of the producer and the name of the article, for example, "Apple cider vinegar," need not fear prosecution, for there will be none unless such vinegar is found, upon analysis, to contain added chemicals or drugs or water, or is otherwise adulterated. White wine, malt, spirits, and other varieties of vinegar are also subject to analysis, and when they are misbranded in non-compliance with the law, the sellers thereof will be subject to a penalty.

As the year just ended furnished a prolific crop of apples, and because of a better understanding of the vinegar law on the part of farmers and dealers, generally, the amount of cider-vinegar produced or stored for fermentation is largely in excess of many previous seasons. Many producers who have applied for information were desirous that the chemists of the Dairy and Food Bureau should make free analytical tests for acidity and solids in vinegar in order that they could sell their vinegar under guarantee, as demanded by some merchants, but this request could not be met, because there is no fund available for the payment of the large expenses that would necessarily follow. The amended vinegar law is decidedly beneficial to fruit growers, and the Bureau will cheerfully furnish copies to all applicants.

PURE CIDER VINEGAR IN INCREASED DEMAND.

It is a matter of congratulation that the fruit growers and farmers of Pennsylvania are commencing to realize the value and importance of their fruit crops better than ever before. The increased facilities for keeping prime fruit in cold storage have caused the average farmer to keep in close touch with the markets, and to-day, the fruit crop and its by-products are being handled to much better advantage and profit than in former years.

One of the sources of gain, has been the increasing demand for pure apple cider vinegar. Although the vinegar law of Pennsylvania, so far as it relates to pure cider vinegar, was misunderstood by many people, the recent interpretation of the act has opened a better market, and farmers and fruit growers receive correspondingly increased benefits.

The Secretary of Agriculture, through the medium of an excellent bulletin, has called attention to the great possibilities of fruit culture in Pennsylvania, and it is believed that with the present favorable market conditions and the improved outlook for fruit culture, this State will soon rank among the leading fruit-growing states of the Union. Its adaptability for successful apple culture is undoubted, and as the farmers have learned too use insecticides and fungicides successfully on their trees and plants, and with our favorable climatic and soil conditions, fruit growing must advance in importance and value.

PROPER CARE OF FRUIT VINEGAR.

The Bureau of Chemistry of the National Department of Agriculture, through Dr. Wiley, its chief official, procured from the farmers and fruit growers of Pennsylvania, hundreds of samples of what were pronounced by the producers or manufacturers to be pure cider vinegar. These numerous and varied samples were intended for analytical examinations to ascertain certain additional information relative to the important question of pure fruit vinegar.

While the large majority of the samples tested made a comparatively fair showing, so far as acidity and solids are concerned, it was found that some of the samples, which had been represented as "extra old cider vinegar," were rather low in acetic acid. It was apparent that while standing in the original barrels, the vinegar suffered deterioration and lost more or less of its acidity. The disappearance of acetic acid is said to be due to forms of fermentation that decomposed the acetic acid, changing it into other substances, largely water and carbon-dioxide.

The National Department of Agriculture, in further relation to the above important subject, gives the valuable information that this destructive change in pure vinegar can, and should be avoided, when once the cider vinegar has reached a sufficient degree of acidity. In actual practice, it is advised that the vinegar be tested, and when it contains the usual standard of acidity, namely 4.5 per cent., it should be drawn off or filtered and then placed in a clean barrel, filling it as full as possible and putting in the bung tight so as to exclude the air. These instructions were in direct contradiction of the plan that had been followed by many makers for years past.

Among the conditions that are often responsible for the production of cider vinegar below the standard, may be named the following:

Poor or watered apple juice; unfavorable conditions to the necessary fermentation process; lack of proper attention and care during the fermentation process; inattention to the product after it has matured.

The vinegar market of Pennsylvania has been flooded with many and varied kinds of so-called "vinegar," and the Dairy and Food Bureau was called upon to investigate their true character upon many occasions with interesting results. The fruit growers of the State can supply the demand for pure fruit-vinegar from their own products, if they will but make the effort. Thousands of bushels of apples are permitted to go to waste, annually, which should be converted into cider. Good, pure apple-cider vinegar is hardly ever lacking a market at a remunerative price, while a low standard and inferior vinegar cannot possibly command either a market or a price, being practically worthless.

The vinegar laws of Pennsylvania are fair and equitable, and the fruit grower who makes vinegar upon a business-like basis need not fear molestation from the laws, but his interests will be fostered and encouraged by the State authorities just as far as he is deserving of such encouragement and recognition. In Eastern Pennsylvania, a number of fruit growers have established a large and profitable market for their vinegar, while they also buy and sell the vinegar made by many of the neighboring farmers.

DEMAND FOR HIGH-GRADE BUTTER.

Considerable speculation arose concerning the high price of butter which prevailed throughout the past year, as the average prices realized in the New York and Elgin markets were far above the normal. There were months when the wholesale price at New York averaged 34 cents per pound for Elgin butter, while near-by fancy and well-known brands commanded considerably higher figures. It was not uncommon to find special brands selling at fifty cents a pound and over, thus realizing a prediction that was sneered at only a few years ago. There is no doubt that with the rapid development of the numerous first-class hotels and boarding houses in the larger cities, the demand for an extra high class of creamery butter is almost sure to exceed the supply.

Dairying, notwithstanding the increased prices now demanded for commercial feeding stuffs, is more profitable than for many previous years, as it is not as much the price as the prime quality of the article that rules the market. The old and unprofitable era of twelve and fifteen cent "June butter" has passed, and because of the improved quality and consequent increased demand for Pennsylvania butter, the producer is correspondingly benefitted. With forage plentiful, and with the increased attention that is being given to cleanliness, sanitary surroundings and, particularly, more scientific care and feeding, the dairyman or farmer is now encompassed by surroundings and prospects that are encouraging. The lowest quotation for butter (June), did not fall below 25 cents for good stock, a fact which forms its own commentary.

NORMAL PERCENTAGE OF BUTTER-FAT IN BUTTER.

The oft-repeated declaration that butter was being manipulated by unscrupulous and dishonest dealers who added an abnormally large amount of water to gain additional profit was not uncommon, although the most careful investigations made during 1907, failed to reveal any case of wrong-doing. The chemists reported that, taken as a whole, the condition of the butter analyzed, so far as water contents were concerned, was but little, if anything above the normal.

The question of the amount of water which may legitimately be present in butter has been discussed at more or less regular intervals by dairymen and others. While the English law fixes sixteen per cent. as the maximum amount permitted, there is no such standard provided in Pennsylvania. The public are exacting in their demand for genuine butter, and severely frown upon any manipulation that may affect its quality, freshness, aroma and taste, while the additional water would certainly be detrimental. One chemist who analyzed 150 samples of butter found that the average per cent. of water was 8.97, and that only eight samples exceeded fourteen per cent., while 114 samples contained less than ten per cent. of water.

In relation to this subject, it might be mentioned that several years ago a few prosecutions were brought against parties in Western Pennsylvania who had added large amounts of water to butter, and as the object of such manipulation was clearly established at court, fines and costs were imposed and the fraudulent practice brought to an end. The analytical report showed that when scientifically done, an extremely large amount of water can be added. In the consideration of normal butter, authorities, as already stated, are somewhat at variance as to the per cent. of butter-fat which butter should contain. In England, leading authorities declare that no butter offered for sale should contain less than 80 per cent. of butter-fat. In connection with an investigation made by a prominent chemist, 113 samples out of a total of 120 samples were found to contain more than 85 per cent. of butter-fat, while the others contained an average of but 80 per cent. This discrepancy might have been ascribed to breeds of cattle, feeding, condition, etc., and all of the samples analyzed were therefore accepted as legitimate.

The Pennsylvania dairyman and farmer has not been charged with the fraudulent manipulation of butter, but the practice was found to prevail among a few unscrupulous dealers.

INCREASED PRODUCTION OF RENOVATED BUTTER.

For the year ending June 30, 1907, there were 49 renovated butter factories bonded which paid the Government tax. These 49 factories produced during the fiscal year 62,919,998 pounds of renovated butter, an increase of 9,124,337 pounds over the previous fiscal year. Of this amount produced, the records show that renovated butter was inspected for export as follows: At Chicago, 3,332,456 pounds; at New York, 1,837,934 pounds; at Boston, 368,090 pounds, a total of 5,538,470 pounds.

The Government authorities report that the general condition of the factories during the year was fair, viewed from a sanitary standpoint, while it is also conceded that the average quality of the product was really superior to what it had been in past years. This is ascribed to the fact that the manufacturers are insisting upon using packing stock that is fresher than that used in former years, while the improved system of manipulation may also have added to its quality.

While the manufacturers under the more recent ruling of the Federal authorities have been granted the privilege of designating the product as "process" or "renovated" butter, Pennsylavnia will still insist upon the use of the term "renovated." The renovated butter law of this State also specifically provides that the wholesale dealer must have each and every package marked with the license number, giving his name and address, and also the inscription in conspicuous letters, "renovated butter." Those interested will do well to read the act of Congress of May 9, 1902, and also the Pennsylania act, approved July 30th, 1901.

OLEOMARGARINE AND RENOVATED BUTTER SALES.

The continued high price of dairy butter during the year had a corresponding tendency to increase the cost of renovated butter, and in a measure, influence the demand for oleomargarine. An examination of the official records shows that there was no increase in the number of renovated butter licenses, but that the number of dealers in oleomargarine was largely augmented. The figures will appear in tabular form in another part of this report. The ratio of increase in the sale of renovated butter as compared with oleomargarine was probably not maintained because of the apparent parity of values of renovated butter and creamery butter. There are indications, however, that the renovated butter manufacturers will again make a concerted effort to have the present restrictive law changed when the Legislature convenes, but it is not at all likely that they will be able to effect any radical changes. The farmers and dairymen will certainly make a strong resistance to any proposed legislation inimical to their interests. The State and subordinate granges of Pennsylvania are a unit against any changes in the present oleomargarine and renovated butter laws. If it were possible, they would secure more stringent legislation, adding strength to several points which are not entirely satisfactory. No renovated butter or oleomargarine factory has been licensed to do business in Pennsylvania, although the Revenue Bureau, at Philadelphia, reports that a tax was paid on an oleomargarine factory, but that it was not opened.

It is now the custom to treat much of the rancid butter found on the market in such a manner as to remove the rancidity. In the early days of this comparatively new industry, the product was sold as genuine, fresh butter. At the present writing it is under strict government surveillance, and each package or parcel must be plainly marked on the wrapper with the words "Renovated Butter." Violations of law for non-compliance with this rule are relatively infrequent. The stringent laws of both the United States and the Commonwealth of Pennsylvania provide heavy penalties for violations.

RENOVATED OR "PROCESS BUTTER."

Since "Renovated Butter" is being sold in Western Pennsylvania in considerable quantities, the following excerpt from a report of the United States Department of Agriculture, referring to this product, will prove of interest. The explanation of the process of making it is of special interest. The article shows that the method of manufacture or treatment is quite different from the "process" used years ago:

"Oleomargarine is no longer a novelty to Americans; its composition and method of manufacture have become matters of common knowledge. Renovated or 'process' butter, on the other hand, having been introduced in a large way hardly more than five or six years, and being retailed usually without other designation than the general one of 'butter,' is as yet hardly known to the general public. All grades of it—good, indifferent, and bad—are met with in our markets. The better grades of it are made from miscellaneous assortments of 'country butter,' mainly 'farmers' rolls,' produced by individual farmers remote from creameries and sold or exchanged at the country stores, this material being treated or 'processed,' as the term is, while still fresh or relatively so. The poorer grades result from the treatment of inferior raw material; for example, the aforesaid 'country butter,' or any other kind of butter, which, by too long keeping, by abuse in regard to temperature, or by unfavorable surroundings, has suffered great deterioration. Experience has shown that only a poor article of renovated butter can be produced from rancid 'stock.'

"HOW RENOVATED OR 'PROCESS' BUTTER IS MADE.

"The process may be briefly outlined as follows: Melting of the butter and settling of the curd and brine, skimming off froth and scum, drawing off and discarding of the curd and brine, blowing of air through the molten fat to remove faulty odors, mixing of milk very thoroughly with the molten fat, rapid cooling and 'granulating' of this mixture by running it into ice-cold water, draining and ripening of the granulated mass for a number of hours, salting and working out of the excess of milk, packing or making into prints.

"By this process, when used upon comparatively fresh raw material, butters of low grade are materially improved, the farmer's revenue is increased, values are enhanced—in short, a good thing is done. Harm begins only when the renovated is sold for the genuine (that is, the original) article, for they are not the same thing. While the fats in the two are practically the same chemically, the nitrogenous portions are not. Moreover, since the article known now and for ages past as 'butter' is an article the last step in which manufacture is the churning of cream, it is evident that the product of an elaborate subsequent process, a process entirely foreign to the manufacture of 'butter,' should be designated by a distinctive name."

LICENSES AND PLACARDS MUST BE DISPLAYED.

Complaints are reaching this office to the effect that certain parties selling renovated butter and oleomargarine neglect to properly display the required placards announcing that such products are being sold or served at their respective business places. The laws specifically provide that every restaurant proprietor or boarding-house keeper who furnishes such articles with meals must be licensed and display cards stating that such imitation dairy products are being served to the guests or boarders. Dealers selling such goods must also place the license certificates and signs, showing that they are selling such goods, in a conspicuous place in the place of business, room, or storeroom, where such product is authorized to be sold.

The special agents of the Dairy and Food Division have been instructed to make a careful investigation throughout their districts and to report all delinquents. The regular license certificate and cards must always be placed so that they can readily be seen by the patrons as well as the State officials who may have occasion to visit the dealers. The matter of distinctly branding each and every package or parcel containing oleomargarine or renovated butter before handing or delivering the same to a customer, dare not be ignored, and dealers who do not strictly comply with this provision of the laws are amenable to arrest and the imposition of a heavy fine.

DUTIES OF CONSTABLES DEFINED BY DAIRY LAWS.

It is the duty of constables to assist in the proper enforcement of the oleomargarine and renovated butter laws of Pennsylvania. Every constable in any city, borough, ward or township, having knowledge of any violations of the aforesaid acts is in duty bound, either upon his own initiative, or whenever requested so to do by the Dairy and Food Commissioner, his agents or attorneys, or by any citizen of the Commonwealth, to make report to the Court of Quarter Sessions of the proper county, as part of his quarterly report, of the name of every person, firm or corporation known by him to have violated any of the provisions of these acts, and of the names of all witnesses furnished to said constable whose testimony it is alleged will sustain and prove the fact of such violation. The acts further provide that it shall be the duty of the judge of the said court to make inquiry of all constables at the time of making the quarterly returns as to whether they have knowledge, and whether any notice has been given to them, respectively, of any violations of this act, in accordance with the terms and meaning of these laws. Where violations are reported, the district attorney shall be instructed to have prompt measures instituted to secure the early indictment and punishment of the offenders.

In one or two instances, such violations were reported, and the courts imposed the usual sentence; but the Dairy and Food authorities desire a still closer co-operation in the difficult work of stamping out entirely violations of the oleomargarine and renovated butter acts.

OLEOMARGARINE PROHIBITED IN CHARITABLE AND PENAL INSTITUTIONS.

The Michigan boards of control of the State prisons, in a spirit of economy, desired to use oleomargarine in the place of butter, estimating a yearly saving of at least $40,000. This apparent saving appealed to the boards, and they were preparing to take action when some rural legislator called their attention to the fact that a law had been passed and was still in force making it a felony to use oleomargarine or similar products in State charitable institutions. This being the case, the management of many institutions wisely decided not to use the substitute for butter.

A similar law is upon the Pennsylvania statutes, and that it is being fully enforced, oleomargarine dealers will readily testify. The legality of the act was disputed, but the courts and the Attorney General sustained its validity and the sale of oleomargarine to such institutions is therefore strictly prohibited. Officials who had been guilty of serving certain institutions with oleomargarine were convicted and fined, although they made a strong defense in court.

Knowledge had reached the Dairy and Food Bureau to the effect that some of the largest public institutions were secretly making contracts for large quantities of oleomargarine for the use of the inmates, but these contracts were annulled before the delivery of the goods, consequently no prosecution was possible. They are under surveillance, but it is not at all probable that the contracts will be carried out. The official list shows that there are about 500 institutions in Pennsylvania receiving more or less State aid, and all of these are under the ban in consequence of the prohibitory regulation, and cannot legally feed oleomargarine to the inmates.

COUNTERFEIT DAIRY PRODUCTS IN CHARITABLE INSTITUTIONS.

There is no question, whatever, as to the unlawfulness for any charitable or penal institution to furnish to its inmates any article designed to take the place of genuine butter derived wholly from pure, unadulterated milk or cream, and the parties selling such substitutes for butter not made from pure, unadulterated milk or cream are also liable to prosecution for every such offense.

The courts of Pennsylvania have affirmed these views, and the Dairy and Food officials must enforce the laws. Special and frequent investigations of the supplies of such institutions have been made from time to time, samples of butter obtained for analysis, and it is a gratifying fact that the year just ended has revealed no violation of the statute.

An examination of the records kept by a requirement of both State and Federal laws proved that some of the Pennsylvania dealers in oleomargarine were shipping large quantities of the article to numerous public institutions located beyond our State lines, but were safe and beyond our interference. Somewhat strange as it may appear to the average Pennsylvania dairyman, reliable information has reached the Dairy and Food Commissioner that some of the State Normal Schools were extensive and regular buyers of renovated or "process butter," rather than use the home product of the farm, which could be purchased at a very slight additional cost. This revelation was all the more surprising because such schools are located in the heart of agricultural districts.

TESTS FOR OLEOMARGARINE AND RENOVATED BUTTER.

Numerous correspondents have renewed inquiries for simple and easy methods of distinguishing between fresh butter, renovated or process butter and oleomargarine. The "spoon test" is suggested as a simple household test. A lump of butter two or three times the size of a pea is placed in a large spoon and heated over an alcohol lamp or Bunsen burner. If more convenient, the spoon may be held over the chimney of an ordinary kerosene lamp, or over an ordinary illuminating gas burner.

If the sample in question be fresh butter, it will boil quickly and quietly, with the evolution of many small bubbles throughout the mass which produce a considerable amount of foam. Oleomargarine and renovated butter, on the other hand, sputter and crackle, making a noise somewhat similar to that noticeable when a green stick is placed in a fire.

Another point of distinction is noted if a small portion of the sample be placed in a small bottle and set in a vessel of water sufficiently warm to melt the butter. The sample is kept melted from half an hour to an hour, when it is carefully examined. If renovated butter or oleomargarine, the fat will be turbid, while if genuine butter, the fat will almost certainly be entirely clear.

There are other tests, but with only ordinary facilities, they are rather too complicated and uncertain, and therefore not recommended. Of course, when suspected samples are submitted by the special agents of the Dairy and Food Bureau, the chemists make a thorough and exhaustive analysis. The sense of taste and smell would not suffice for testing suspected oleomargarine.

ILLEGAL PEDDLING OF OLEOMARGARINE.

One of the many obstacles encountered in the vigorous enforcement of the oleomargarine law of Pennsylvania was that presented in Philadelphia where peddling was in vogue by unlicensed parties. These violators of the law made a canvass of their respective districts, selling oleomargarine to boarding-house keepers and private families at the price of fancy butter. While the special agents of the Bureau, by vigilance and careful detective work, very often succeeded in obtaining samples of the oleomargarine sold, either from the peddler direct, or through some boarding-house keeper or private family, it was necessary to apply the usual heat-test, as well as subject the sample to chemical analysis in order to prevent mistakes. While this necessary work was being done, the peddler made his escape, and in some instances, would not reappear in that part of the city, thus baffling all attempts to arrest him. It was further believed that housewives, innocently or otherwise, referred to the agent's work in procuring samples, and thus assisted in frustrating all plans to arrest the violators of law.

This part of the field work demands the greatest amount of tact and good judgment, and it is absolutely necessary that the shrewdest detective resources be exercised by our agents in order to arrest such violators. When caught, the Dairy and Food Bureau will insist that the heaviest penalty be imposed, since a double wrong is inflicted. While the practice was common at one time, it is believed that it will soon be obsolete, and that none but properly licensed dealers will be willing to handle or attempt to sell oleomargarine in this State.

MORE STRINGENT RULES FOR OLEOMARGARINE LICENSES.

The abuse of both Federal and State oleomargarine licenses has prompted the authorities of Pennsylvania to adopt severe regulations relative to the granting of such license certificates.

Careful investigations made by attaches of this Bureau proved that licenses in many cases were granted to applicants who had no fixed place of business, who were not engaged in any other business than that of peddling produce, including the illegal trafficking in oleomargarine, whether colored or uncolored. These parties resided in private dwellings, which often were difficult to locate. In other instances, these investigations brought to light the fact that stables or other out-of-the-way structures had been indicated in the license applications as their places of business for selling oleomargarine; this applies to Philadelphia.

The Commissioner is therefore strongly of the opinion that some additional information must hereafter accompany applications for both oleomargarine and renovated butter license certificates, in order that their issue to legitimate applicants may be duly safeguarded.

The oleomargarine act of 1891 confers discretionary powers upon the Commissioner, and these will hereafter be more fully exercised than ever before in considering applications for licenses. Where it is not evident that an applicant has a legitimate place of business and is acting in good faith, it lies within the powers of the Commissioner to refuse the application.

CO-OPERATION OF FEDERAL AND STATE AUTHORITIES.

Through personal interviews with the revenue authorities at Washington, and considerable correspondence, a system of co-operation in ferreting out illegal dealers in oleomargarine in Pennsylvania has been established. These plans have already borne excellent results in the Philadelphia district. The detection and arrest of a number of dealers in colored oleomargarine, as well as the prosecution of unlicensed peddlers of oleomargarine, was accomplished by this co-operation, and there was no difficulty in presenting joint evidence to both the United States and local courts to secure the conviction and punishment of the defendants. These several courts not only imposed heavy fines, but added jail sentences. The effect has been salutary and far-reaching and there is a corresponding decrease in the number of violations.

NEED OF ADDITIONAL NATIONAL OLEOMARGARINE LEGISLATION.

At the instance of the Pennsylvania Pure Butter Protective Association, a bill will be formulated and introduced into Congress that will make the Federal oleomargarine statutes as strong and effective as the laws of Pennsylvania. The proposed measure, among other changes in the present National oleomargarine laws, will prohibit the admixture of any butter in the manufacture of oleomargarine. The tentative permission to use butter, whether colored or uncolored, in oleomargarine, is to be annulled because it makes it more difficult of detection. The laws are also to be changed so as to require a system of serial numbers that will enable those interested to trace the manufacturer and every dealer who may have handled the same. The National law would also be changed so as to make it necessary to prove that the yellow color of oleomargarine is due to a foreign substance introduced for the purpose of giving color.

The proposed changes would make it conform in a large degree with the Pennsylvania law and afford additional protection to pure butter which is not at present given by the National law on the color question.

The pure butter advocates also enter a protest against settling and compromising oleomargarine cases, now the frequent practice of the revenue officials. They will also insist that the statute shall be more strict regarding the proper display of stamps, marks and brands on packages containing oleomargarine and renovated butter, in order that the public can readily see the same, and thus identify the contents of packages. The Pennsylvania Pure Butter Protective Association has a large and influential membership, and these will unite in a strong and united effort to secure the desired changes in the National laws.

FOSTERING DAIRY INTERESTS IN PENNSYLVANIA.

Letters are constantly reaching this office, demanding statistical information relating to dairying in Pennsylvania, also with requests for complete lists of the creameries and cheese factories doing business in this State. While it is true that the latter requests come mainly from parties who desire to use them solely for commercial or advertising purposes, this is no valid reason why such a compilation of information should not be made and published. In many instances mutual benefits would be derived. The available information is either obsolete or unreliable, and the Legislature could readily make a small appropriation to enable the collection of such information to the advantage of the Commonwealth. In cultivating the acquaintance and friendship of such inquiring correspondents, we would in most cases learn that we were but adding strength and solidity to our already great corner-stone of improved dairying, and increased incomes for the representatives of that industry. The expenditure would be wise and the results beneficent. Advertising the dairying resources of Pennsylvania would be money judiciously expended, and a guarantee for a greater and more successful future development.

ADVANCEMENT AND PROGRESS IN DAIRYING.

The Dairy and Food Division of the Department of Agriculture believes in fostering a community of interests, and is therefore happy to acknowledge the good that is being done in Pennsylvania by such friendly allies as the Pennsylvania Dairy Union, the Pennsylvania Livestock Breeders' Association, State Livestock Sanitary Board and other organizations interested in kindred subjects. For their continued support, co-operation and encouragement, special acknowledgments are due and are hereby tendered.

While it is true that the more progressive and modern milk producers desire additional legislation to improve the dairy supplies of the Commonwealth, there are others who have strongly opposed compulsory laws and their enactment. As a result, some of the measures suggested at various periods have been defeated, and must await the legislative session of 1909 before they can be revived, reconsidered and enacted into laws for the benefit of the people.

The average dairyman has now a more comprehensive grasp upon certain of the fundamentals of dairying than ever before; he knows far more about feeding standards, rations, and the home-growing of feeding stuff than at any previous period; but with all of this added knowledge, there is room for further improvement, such as will surely enhance the interests of the Pennsylvania dairymen and farmers generally. An evolution is in progress, and as we are free to acknowledge, science has taken forward steps that a few years ago was regarded as only visionary and utterly impracticable.

It is not improbable that at some far distant day, the work of the Dairy and Food Division may be confined to dairy work solely to meet the new conditions that will surely come.

IMPROVED DAIRYING IN PENNSYLVANIA.

Emerson says, "If a man can write a better book, preach a better sermon, or make a better mouse-trap than his neighbor, though he build his house in the woods, the world will make a beaten path to his door."

It is this effort on the part of many who have a real, genuine interest in dairy researches that is responsible for the changed conditions that surround to-day many successful dairy farms and their production. There is a new era of progress before the people, and with the present prosperity of the country, all channels of trade feel the renewed pulse of activity, and the consequent demand for a better grade of food supplies of all descriptions.

The producers of Pennsylvania have been correspondingly benefitted, and today, there are scores of butter manufacturers throughout Pennsylvania who have adopted these new and improved methods, with the result that they are commanding large prices for their butter and cream, while the demand is greater than the supply. There are butter makers in Southern Pennsylvania who have fixed yearly contracts for all the butter they can furnish, at prices much above the normal quotations; this is owing to the exceptional quality of the butter they furnish. There are neighbors who could imitate, but they lack the spirit and ambition that is a requisite to success in the business.

Attention is called to this extreme variation in values merely to show what progressive dairying has done, and to drop a hint to those who have the splendid opportunities for following the examples cited.

PUBLISHING RESULTS OF MILK ANALYSES.

One of the benefits accruing from the general and extensive examination that was made into the milk supply of Pennsylvania during 1907, was the publicity that was given to the names of those who supplied their patrons with good milk, as well as those of dealers and others who were arrested and fined for the sale of adulterated milk and cream. The last named list was comparatively small, much to the satisfaction of the pure food officials and the public.

The honest dealers were exceedingly glad to have the public know what kind of milk they were selling. It was therefore decided that the lists of samples, names from whom obtained and the results of the analyses should be published in the newspapers of the localities in which the samples were obtained by the sworn agents of the Bureau. This list was promptly mailed to the leading newspapers in the counties represented in the list of samples analyzed, and their publication followed without delay. In some cases such reports were given special display, while editorial comments of a most favorable character almost invariably followed.

City officials in some instances had their attention drawn to such reports, and particularly where milk of inferior quality was sold, and in the meantime, they will make an effort to secure a better and more wholesome milk supply. One of the revelations of the examinations made by our chemists was, that the Pasteurization of milk is not a remedy for its unsanitary method of production; or in other words, while clean, Pasteurized milk is good, impure and adulterated milk cannot be made right by Pasteurization.

It is plainly evident that health commissioners should know more about milk, and that they should not care about the enmity of the milk dealers whom they arouse in the performance of their duties as officers of the law. The Special Agents of this Bureau performed their sworn duty with fairness and impartiality.

BACTERIOLOGICAL EXAMINATIONS OF MILK.

In the examination of thousands of samples of milk, there is a constantly recurring demand made for bacteriological knowledge, but as stated in a preceding report of the Dairy and Food Bureau, the main laboratory at Harrisburg has not as yet been equipped with the proper facilities for making such determinations. The average sample is tested for added water, chemical preservatives, coal-tar colors, etc., and in addition the fat contents, as well as solids are carefully determined by our chemists.

The importance of making bacteriological tests is apparent, although in cases where there is an outbreak of contagious or infectious diseases in a dairyman's family, the local health authorities usually assume control and responsibility. They are advised by the State Department of Health as to the proper course to pursue, so as to reduce the danger of spreading disease to a minimum.

In a compilation of laws recently issued by the State Health Department, special attention is invited to this all-important subject, and there is no doubt that the township, borough and city officials, generally, will co-operate and thus render invaluable services to the people of the Commonwealth in combating diseases at a time when they can be controlled. Where typhoid fever appears in a dairyman's family, it is of the utmost importance that not a drop of milk should be served to patrons or members of the family afflicted, unless such milk comes from a source that is entirely above suspicion. With the exercise of a little care and good sense, conditions can be materially improved.

MUNICIPAL EXAMINATION OF MILK SUPPLY.

During the examinations made into the milk supply of many of the cities and boroughs of the State, it was shown that probably no article of food is being more generally consumed than milk, and a wholesome supply is therefore of the greatest importance.

A peculiarity of the situation that forced itself upon the pure food authorities was the wide variance in the manner in which local health officials looked after the milk supply of their respective places. Several of the larger cities have a thorough and practical system, while others appear indifferent and lack even ordinary knowledge of the quality of the milk and cream that are being served.

It is suggested that a convention should be held where the organizations interested, including sanitary commissions, could exchange views and devise plans to improve the quality of market milk. That the representatives of such bodies could devise plans and means that would be of inestimable benefit cannot be gainsaid, and as the expense would be small, it is to be hoped such a convention may be held at some central point during the coming year.

The local legislation in force in some of the cities and boroughs might be regarded as ample and sufficiently far-reaching, but in too many cases, political and personal reasons may intervene and thus circumvent the otherwise good work of those in authority. There is much encouragement gained by reading the reports that come from Erie, as well as several other Pennsylvania cities, where the public officials are vigilant, but there is room for further improvement.

THE VALUE OF MILK INSPECTIONS.

One of the most remarkable results of the rigid examinations conducted into the milk supplies of cities and boroughs, is the fact that the use of formaldehyde as a preservative of milk and cream is now almost entirely unknown, while several years ago the adulterations with formalin reached as high as twenty per cent. Other chemical preservatives were also employed. Possibly there is no more powerful preventive of decomposition or souring of milk known, but its harmfulness is undisputed, and in consequence, the miscreants using the material were prosecuted to the fullest extent of the law. With the improved methods of chemistry and the practical knowledge derived through years of experience, it is claimed that to-day it is impossible to use formalin in dairy products without detection; in fact, there are those who claim that even in the proportion of one part to 500,000 parts of milk, its presence can be detected by the expert analyst.

In the City of Chicago, the Health Department found that in 1891, the year before the attempt at a laboratory and milk inspection was begun, there were 12.801 deaths among 145,095 infants and children under five years of age—a ratio of 886 in every 10,000 of this age period. In 1904 there were 7.052 deaths among 208,893 infants and children below five years of age, showing a rate of 337 instead of 866 in every 10,000 of this age period. With recent years, this figure has been still further reduced, but not to the same extent, proportionately, because of the improved sanitary conditions and the strict inspection of all dairy supplies. In Pennsylvania, the conditions were, if possible, even worse, and the Dairy and Food Commissioner was therefore obliged to impose many and heavy fines before the evil practice was controlled.

DANGER IN MILK WHERE TYPHOID EXISTS.

At various times the Dairy and Food Division received complaints from persons who asserted that milk and cream were being sold or peddled by the members of families in which typhoid fever prevailed. While it is the purpose of this office to assist in maintaining a proper sanitary condition and to urge strict cleanliness, it is not within its power to take the heroic action that would be suggested by such complaints. The matter very properly comes under the jurisdiction of the State Health Department, and consequently all such complaints are promptly referred to that important bureau for immediate attention. Commissioner Dixon formulated and promulgated special regulations governing the care, use and sale of milk in families in which certain contagious or infectious diseases exist, and will insist upon a strict compliance.

In nearly all instances where typhoid fever is abnormally prevalent, its infection and spread can be traced to faeces-polluted water or the milk supply. One of the most unfortunate conditions in the smaller towns and villages is in the fact that no one is willing to interfere with the sale of the milk that may come from such diseased producers, because of the personal animosity that might follow, the loss of trade or other causes. Whether we slake our thirst from the village well or drink the appetizing milk, there is an element of danger that cannot be overlooked. Truly, pure and uncontaminated water and fresh, sweet and pure milk cannot be too highly rated, being simply beyond price. Every possible influence to increase this supply should be exerted for the public good and the protection of life.

PURE MILK FOR CHILDREN.

It is often said that the food laws of this Commonwealth are drastic, and that in some instances they may work unwarranted hardships upon those who are found guilty of violations. The Chinese take a much more serious view of the effect of adulteration on the public health, as by Chinese laws, such infractions at one time were punishable by death.

Among the many complaints that reached this Bureau, were letters which came from families who alleged that the health of their infants was being jeopardized by the sale and use of milk which was believed to be adulterated, chemically preserved, or below the normal standard.

As the child is usually fed by measure rather than according to the richness of the milk, the result is that it will eventually suffer loss of health if the milk is lacking the proper nutritive strength, and even this reduced nutritive value may be materially reduced if not entirely eliminated by the addition of some chemical preservative to the milk.

Under these circumstances, it is well that the proper local authorities should keep in close contact with the dairymen of their respective districts, for in no other manner can they accomplish more genuine good. With the nourishing power of milk abstracted or reduced, by watering or skimming, the infant and invalid will certainly become a helpless victim to this unpardonable form of adulteration.

CITY AND BOROUGH MILK DEPOTS NEED INSPECTION.

Legislation is urgently needed in this Commonwealth in connection with its thousands of "milk depots." Laws should provide for a frequent and rigid inspection of all milk depots wherever established, and the needed officers should work under the direction of State authority. The penalty for a violation could be fixed at a reasonable amount; for example, from $5 to $25, and thus the party guilty of a violation, would not be seriously embarrassed, and though poor and honest, if he accidentally permitted the establishment to get below the standard, he could pay the fine. The law should provide that habitual and willful offenders should be indefinitely barred from the milk business.

The unsanitary conditions that surround many of the small milk depots in the larger cities are intolerable. The rooms in which milk and cream are kept and sold too often are of a most disgusting character and abominably filthy, lacking ventilation and all pretense of cleanliness. As many cases of sickness, including typhoid fever and other contagious diseases, are directly traced to the sale of infected milk, there are special reasons for co-operating with all the authorities to bring about an improved condition in the direction indicated. Not only every room in the house in which milk and cream are sold should be kept scrupulously clean, but a milk depot, which should invariably be located in a sanitary place.

INSPECTING CREAMERIES, MILK STATIONS, ETC.

The continued agitation for the frequent inspection of dairies and milk depots has caused much discussion, pro and con. The farmers and others who were opposed to the proposed examination of milk and milk supplies happily are in the minority, as the leading large producers realize that with improved facilities and increased production, combined with a superior quality, there is nothing to fear or lose, but all to gain. A dairyman or farmer is entitled to every possible consideration—no more nor less protection than any other man, firm or corporation engaged in producing or handling milk or any other article of food.

In the general house-cleaning that has been conducted during recent years, creameries, shipping stations, canning establishments, packing houses, milk stores, etc., have all been subject to public scrutiny, and no classes should be exempted. The Dairy and Food Commissioner is determined that the public shall be supplied with pure, clean and wholesome food products. The best information obtainable indicates that of the entire amount of milk produced, not more than two per cent. is regarded as unsafe; let this small proportion be reduced still further, if it cannot be entirely eliminated by judicious and heroic treatment.

MILK TESTS AT CREAMERIES URGED.

During the past year a number of proprietors of creameries have written to this Bureau, requesting that the milk that was being delivered to them by their patrons should be analyzed or tested at more or less regular intervals by the State in order that they might be protected against possible imposition.

The Dairy and Food Bureau could not possibly meet these requests with the present force of special agents, to say naught about the increased appropriation that would be needed. While the Dairy and Food Commissioner would be pleased to co-operate with the creamerymen to bring about the absolute purity and cleanliness of the entire milk supply, he cannot, for the reasons already specified, grant such requests, and can only suggest that there should be a more general use of the Babcock-test and the lactometer. These instruments will give all the information necessary regarding the composition of milk delivered to the creameries or milk depots, and as both tests are comparatively inexpensive and simple, their adoption is therefore strongly urged.

Many of the leading creamery proprietors of the State have been compelled to keep fully informed at all times as to the quality of their milk supplies, and in consequence are realizing increased profits. No time is set for making such examinations, and consequently patrons are aware that their milk may be examined at any time, and they will therefore desist from watering or skimming. Some of the larger creameries have complete weekly records of the milk received from their patrons, covering years, and when required, they can at a glance show the average composition of each individual supply received during a term of years.

QUESTIONABLE ARTICLES IN MILK AND CREAM.

"Cream thickeners," coloring materials for use in milk and cream, and the many articles of uncertain and unknown composition used in the manufacture of ice-cream, have been under serious suspicion. Sucrate of lime or gelatin used as a "thickener" may be very properly termed a fraud in milk products. Reputable manufacturers and jobbers in dairy supplies long ago discredited many of these doubtful and uncertain preparations, and this aided the Division in the work of educating the people to their harmful and deceptive character.

It is the positive intention of the dairy and food officials to follow these violations of the law as vigorously as possible. With better laws and their more rigid enforcement, the dairymen and milk producers of Pennsylvania are already experiencing an increased demand for their product, since a long-standing prejudice has at last been partly, if not entirely removed. The most wholesome and useful of all food—good, pure, milk, is again being used more freely since the confidence of the public has been restored. It is also indisputable that the present prices realized by the producer of pure milk are the highest and perhaps the most remunerative known for a long term of years. It has resolved itself into a question of absolute purity and quality, rather than price.

With the elimination of dangerous chemicals and "dopes" of many kinds, the milk supplies are of a higher and better grade, and the producer and consumer are proportionately benefitted by the improvement which was so difficult of realization, and only realized after many repulses.

HOUSEWIVES SHOULD CLEAN MILK BOTTLES.

As the average housewife knows, when milk is once dried in a bottle, jar or other receptacle, it requires a great deal of labor to remove it. Possessing a special interest in pure, clean and wholesome milk, she can, therefore, assist the local dairyman in maintaining a supply of milk of an improved quality by cleaning all such utensils immediately after they are emptied, and before they are returned to the owner. If the dairyman does not properly wash and clean the cans and pails, milk from the previous milking will adhere to such receptacles, and containing as it does, myriads of bacteria which multiply at an alarming rate when combined with other or new milk, it is not difficult to conjecture the evil that must follow such a combination of active agencies.

This matter should be impressed upon the minds of milk consumers, although it is perhaps only too generally accepted and believed that the milk-man should alone be held accountable to the public for the absolute cleanliness and purity of the milk delivered and sold by him. As ordinary dairy utensils contain depressions and grooves, it is well to keep supplied with a suitable brush to clean such utensils, rather than depend solely upon a cloth, which at its best, may not be too clean. Unless a brush is used, the places not covered during the cleaning process become veritable breeding places for bacteria. After washing, scalding and brushing such utensils, they should be exposed to the sunlight, as the direct rays of the sun are fatal to bacteriological growth. The sun-bath costs nothing but a little extra labor, but its value cannot be over-estimated.

COW TESTING ASSOCIATIONS.

In a number of states, the dairymen and others interested have organized what are known as "cow testing associations." Such general tests gave surprising results. In many instances, they resulted in the weeding out of herds of cows that were unprofitable because of the low percentage of butter-fat derived from their milk, or because of the small quantity of milk which they produced even under good care and feeding.

Many years ago a series of experiments conducted in Pennsylvania under the auspices of the State Board of Agriculture proved very conclusively by the actual results obtained during such experiments, that the average farmer owned one or more of these unprofitable cows, and that the owner became poorer with each succeeding day that the herd was kept intact.

The testing system is comparatively inexpensive, and it is reasonably certain that if once inaugurated in Pennsylvania, it would not soon be abandoned. The usual plan in vogue is to test the milk for a specified period, usually a week or longer, and at the end of the testing period, calculations are made as to the cost of the feed, value of the milk produced, etc., all with scientific accuracy. Canada is possibly in advance in this movement, and the expense is borne by the government, just the same as expenses are paid for the promotion of all agricultural interests of the Dominion. "Cow test associations" are a necessity in Pennsylvania, but earnest and active personal work of dairy enthusiasts will be necessary to start the good work.

MANUFACTURING DAIRY PRODUCTS ON FARM UNPROFITABLE.

The practical experiments made upon the farms of Pennsylvania, taken as a whole, show that it is undoubtedly the best business policy on the great majority of farms, to send the milk or cream to some special central plant to be manufactured into butter, and that in only a comparatively few instances is it really economical to manufacture the customary dairy products on the farm.

Of course, where a dairying district has the advantage of good, near-by markets for the whole milk, and where the farmer or dairyman can guarantee clean, pure and wholesome milk, the city market may be found to be the most remunerative. Customers can be found in any of the large cities and towns who will buy and handle an extra quality of milk, at a fair price; but quality and excellence are of prime importance to command the best rates.

Conditions throughout the State have changed very materially during the past decade, and as a result, a comparatively small amount of "country-butter" or so-called "country roll butter" is being made and marketed. In its place, the city consumer now buys dairy or creamery butter of a quality far superior to the old style butter, which too often was an abominable, stale mixture, made only to sell to some poor, unsophisticated patron, hundreds of miles distant from the farm on which it was produced by a careless and indifferent butter-maker.

It is the policy of the Dairy and Food Bureau to assist farmers and dairymen in every possible and practicable way, but it could never afford to endorse the manufacture of inferior and unwholesome dairy products of any description.

CONDENSED, VERSUS FRESH MILK AT ENCAMPMENTS.

One of the somewhat singular conditions that attracted the attention of the Dairy and Food officials during their visits to the various military encampments of the State, was the fact that the use of condensed milk had assumed such large proportions on the field. It is believed that a majority of the military companies had resorted to the use of condensed milk in preference to whole milk, such as was usually supplied by neighboring dairymen and farmers.

This was mainly due to the fact that in previous years, the milk supplied to the soldiers was found to be doped with formaldehyde, skimmed or watered. It is gratifying to add that some of the violators of the law were arrested, convicted by a court trial and sentenced to the payment of heavy fines and costs.

A special report upon the subject of condensed milk and invalids' foods prepared by Prof. C. B. Cochran, Chemist of the Bureau, who analyzed all of the leading brands, had a wide circulation. When made from whole milk, condensed milk was not subjected to criticism; but when manipulated for gain, and when not properly handled, it may be placed upon the market in a condition so that it would contain very little life-sustaining properties. Fresh milk, on the other hand, is regarded as a typically perfect food. Prof. Cochran's report is one of special value and importance.

The examination made into the milk supplied to these encampments during 1907 proved that the work of former years had borne excellent fruit, as the general condition and quality of the samples analyzed was excellent. The military officers in charge of the encampments expressed themselves as being highly pleased with these invstigations, knowing the harm that has been done by the unscrupulous adulterators in preceding encampments. They co-operated in every manner with the Dairy and Food officials.

THE USE OF COMMERCIAL BACTERIAL FERMENTS.

Several years ago, the use of commercial bacterial ferments, in milk, cream, cheese and butter attracted much attention in Denmark and Germany. In this country, several scientific gentlemen became investigators of similar organisms, with varying results. The cultures thus obtained were sold to those interested in dairying, and when carefully employed and under favorable conditions the results obtained were satisfactory; but where indifference and the old-style systems were predominant, the effect was not what had been desired, but possibly what could reasonably only be expected. It was this varied experience that no doubt prompted the inquiries upon the subject that were received by the Dairy and Food Bureau.

It was claimed that a considerable number of factories secured an increased flavor and quality in their product from ripening their cream with the aid of these bacterial preparations, but the general deductions derived from observations is to the effect that the use of such artificial ferments is not necessary to produce high grade products where all the ordinary surroundings are cleanly and favorable for good results.

In Denmark, the cream is first Pasteurized and then ripened with the aid of artificial bacteria culture; but comparing our own American butter of the high-grade manufacturers, it is doubtful whether they could successfully compete against us. With the proper care of the average dairy and creamery, there is no reason why the desirable germs that give quality and flavor to the butter should not exist and render the use of the commercial bacterial ferments entirely unnecessary.

Under these circumstances, the Dairy and Food officials are of the opinion that these correspondents were perhaps best qualified to judge as to the needs of their respective dairying interests and that it was not possible nor wise for us to advise them, for with proper care, butter of the best quality in color, texture and flavor may be made from the milk of any breed of cows.

"ROPY-MILK" TROUBLES OF DAIRYMEN.

The warm season presents many problems to the producers of milk and its products, and among the letters received by the Dairy and Food officials were a number referring to the fact that "ropy milk" was being produced by certain animals or herds, and asking for proper remedies.

Those competent to determine the cause of such disturbance in milk supplies will ascribe it to bad sanitary conditions. One species of bacteria that speedily manifests itself in unclean milk causes what is known as "ropy milk," a condition showing itself more quickly in the cream than in milk. It is said to be antagonistic to the lactic bacteria, and frequently cream and milk well inoculated with it will remain sweet for a considerable length of time. In fact, milk has been examined, which, while almost solid, still remained sweet. When these conditions prevail, unclean conditions exist somewhere in the production of that milk. It may be the cow, it may be the stable, it may be the milker, it may be due to unclean utensils; the only effective remedy is scrupulous cleanliness.

Some of the correspondents who reported the prevalence of "ropy milk" ascribed it to various vague and imaginary causes, and in a majority of cases suspected or admitted all but the real source of the trouble.

SELLING PURE BUTTERMILK AS A BEVERAGE.

A sentiment favorable to the increased consumption of buttermilk is rapidly growing in the cities, and the producer is therefore realizing an increased margin of profit from its sale. The taste for buttermilk is easily acquired, and as the consuming public are learning to appreciate its health-giving qualities, the producer should endeavor to produce an article of exceptionally good quality. The price that a critical public are willing to pay for the beverage should justify the expenditure of a little more trouble and time in its preparation and treatment for the city patron. The physician who prescribes buttermilk or skim milk for his patients who are suffering from certain ailments will insist that the article supplied shall be of a cleanly and palatable character.

AVERAGE PRICES OF MILK IN PENNSYLVANIA CITIES.

A compilation of the average selling price of unskimmed, fresh milk, delivered to the consumers, shows a somewhat remarkable uniformity in figures, the price averaging exactly eight cents a quart, for the year, in the following cities: Philadelphia, Pittsburg, Allegheny, Scranton and Wilkes-Barre. In the cities of Reading, Lancaster, Easton, Allentown and smaller places, the average was somewhat lower, slightly exceeding seven cents per quart. This was due to the absence of the higher transportation rate that applied to the larger cities, local supplies being sufficient for the smaller cities and boroughs or the haul being shorter and cheaper.

HOW TO COMMAND THE BEST PRICE FOR MILK.

Although confined within a limited appropriation, the State Livestock Sanitary Board has yielded a far-reaching influence, and has greatly reduced the percentage of tuberculous cows in the Pennsylvania herds. It is therefore suggested that in every case where the owner has reasons to believe his herd has become infected, he communicate at once with the Board, presenting the facts for the information of the State authorities. The present conditions of our civilization has placed milk high in importance, air and pure water alone having precedence in sustaining life. This is especially true so far as infants and invalids are concerned; consequently, the increased demand for milk of approved excellence and purity—a theme that to-day is of National importance.

If the dairymen cannot remedy some of the evils that are of such general complaint without receiving an increased price for his products, let him be paid an increased price, and then discontinue serving the impure and infectious article. It would certainly be far better to supply only pure and healthy milk, thus reaping a double profit, not only in a monetary sense, but the community would also profit by having better health, fewer deaths and less suffering.

With tuberculous cows exterminated from the dairy herds, and the general improvements advocated inaugurated, the dairymen will be in a position to not only select his clientele, but fix his own prices.

THE NEW STANDARD FOR MEASURING MILK.

The long standing complaint emanating from milk producers that they were not treated with fairness when selling their milk to the city markets because of unfair measure being exacted, resulted in the passage of an act providing for a milk and cream standard of measurement. Under this law, every gallon of milk and cream must contain 231 cubic inches of liquid per gallon, while under the old enactment the producer furnished milk and cream at a low rate by "dry measure," and the purchaser disposed of it by liquid measure, the difference alone affording a good share of profit.

With this special legal requirement for a standard gallon of milk or cream, there need be no further controversies, and the honest dealer will also be relieved from further embarassment since he buys and sells by the same legalized standard. The act referred to is now in force, and dairymen and others must govern themselves accordingly.

LAW REQUIRES CLEANSING OF MILK CANS.

While it is a matter of common knowledge that there is no better medium for the dissemination of filth and disease germs than milk, many dairymen and dealers were woefully indifferent as to the condition of the cans and other vessels employed in shipping milk and cream over railways to distant patrons. Many vessels were returned without cleaning them until the conditions became intolerable. As a result, a law was enacted last winter which imposes a fine not exceeding fifty dollars for neglecting to clean milk cans and other vessels before returning them to the original shipper. The law further provides that the prosecution can be brought by any person aggrieved by such negligence. It is therefore not dependent for enforcement upon any health officer or State official, as was supposed, but is available by the individual or ordinary citizen whenever the occasion may warrant such action.

Many dealers would ignore all sanitary requirements, and permit milk cans to become so foul, filthy and odor-and-germ-laden that they were a public nuisance. Although the law has been in force only a few months, there is a marked change for the better, and the effect is salutary and beneficial in many directions. Just a few prosecutions of the more glaring offenders in a city will produce a good moral effect.

Local boards of health in the cities and boroughs will see to it that the law is properly observed, and where delinquents will not take heed, prosecutions will necessarily follow.

Rusted and badly corroded milk cans are also a menace and should be condemned because of their unsanitary condition. Such cans can hardly ever be placed in a sanitary condition even with careful treatment.

LAW TO PROTECT PROPERTY OF DAIRYMEN.

Another proposition now to be considered is a proposed act of Assembly to prohibit unauthorized parties from the unlawful use and destruction of milk cans and other receptacles employed in the transportation of milk and cream. Such legislation is now being enforced in other states, and as the loss from this source aggregates thousands of dollars annually, there is no valid reason against similar legislation in Pennsylvania.

The brewery and bottling interests have special legislation for their protection against the willful destruction of barrels, bottles, etc., and it is equally important that the dairying interests should be similarly protected against wanton loss. The act should prohibit the selling, buying, destroying, injuring, disposing of or concealing of any milk or cream-can, jug, bottle or jar belonging to such milk producer or dealer, under a severe penalty. It should further provide against defiling or befouling in any manner any such receptacles, thus affording additional protection against their misuse.

GOOD, VERSUS BAD SYSTEMS IN BUTTER MAKING.

In a certain state, the farmers living in the vicinity of one of the agricultural experiment stations made butter until the hot days of July, and then gave up the work because they were unable to make a product of good quality. The cream was then delivered to the college creamery, where, under different methods, butter of a good quality was readily produced.

It is a well known fact that entirely too large a percentage of the butter produced in Pennsylvania during the warm months of the year is of such poor quality that it seems imperative that new methods for the care of the milk and cream and the manufacture of butter should be strenuously urged. While it is claimed that age will have a deleterious effect upon the quality of cream, and that the private dairy does not have a supply of cream sufficient to warrant daily churning operations, it is equally well known that bacterial development in cream is largely influenced by temperature and cleanliness. It is also a well known fact that the bad bacteria develop more rapidly than the desirable forms, and that to prevent the excessive development of bacteria, the milk and cream should be kept cool, and the cream delivered to the local creamery with greater frequency. The ordinary souring of milk is due to the action of lactic bacteria on milk-sugar changing it to lactic acid. After all has been considered, the same self-evident truths stand out pre-eminent: Good clean milk produces rich cream, and when handled at a low temperature and promptly converted into butter, there is but little doubt as to its superior quality.

It is a matter of genuine regret that this important question does not receive more frequent and careful attention at the farmers' institutes, and the subject is broached here in order that the intelligent housewives and homemakers may arrange to have this subject fully discussed at some of the coming institutes.

MORE PROFITABLE COWS NEEDED.

Although some claim that now and then a herd of common cows may do as well as the dairy or thoroughbred cows, an increased number of the better grade of cows is now found on the farms of the State. The thoroughbred stock will, in the aggregate, show the largest financial gain. This fact is substantiated by the number of dairymen and farmers who are constantly in quest of a better grade of animals, and the additional fact that sires are now being introduced into many herds at fancy prices for the purpose of increasing the herd with improved blood.

When the quantity of milk is the main object in view, there are certain distinct breeds desired, such as the Holstein, etc.; but when rich milk, that is, milk containing a high percentage of butter-fat is desired, the Jerseys, Guernseys and other equally well-known breeds receive first choice.

The dairying interests of Pennsylvania are gaining in value at a rapid rate, and many radical changes, as compared with former methods, have taken place during the past few years. The production of milk and its products has become a problem of scientific skill, good judgment and business capacity, and as a result, scientific feeding and the proper stabling and care of the animals is a factor of greater importance than ever before. There are still hundreds of cows upon the farms of Pennsylvania that are a source of constant loss to their owners, their yielding capacity being insufficient to pay for their care and keeping. Such farmers should apply the usual milk tests, and they would soon discover the cause of their inability to make a profit.

ARTIFICIAL COLORING OF BUTTER.

The artificial coloring of butter continues, and so far as is known, is permitted in every state in the Union. The experiments made in certain Western States to prohibit such artificial coloring did not meet with any degree of success, and in at least one instance, interefered with the dairy industry of a state to an alarming extent; in fact, had not the prohibitory color-clause been rescinded, all of the dairying industry so far as butter was concerned, would have been diverted to adjoining states where more liberal legislation was prevalent. It might be said in all truth and candor, however, that the principles underlying and governing legislation regarding coloring matter in foods in general have not been ordinarily applied to the coloring of butter.

Dairymen, provision merchants and others have applied for information regarding the legality of the use of butter colors, and the invariable reply is to the effect that there is no law on our statutes denying the right to use harmless or purely vegetable colors in the manufacture of butter. Where positively poisonous materials are found in dairy products, whether in butter, cream, cheese or milk, prosecutions would be proper and brought without any hesitation. The close observer in the markets of Philadelphia, New York and other large cities will note that there is a decided tendency to prepare the best grades of butter with a lighter tint and a more natural color than heretofore. The so-called "rich, golden yellow color" is no longer desired nor in vogue with those controlling the best trade. Several proposed acts to regulate the coloring of butter were introduced in the Legislature, but failed of final passage.

CATTLE FEEDING STUFFS ANALYZED.

One of the mediums intended to foster and encourage dairying in Pennsylvania was the enactment and approval of a law providing for the regulation of the manufacture and sale of commercial cattle feeding stuffs. The act in question is under the jurisdiction of the Honorable Secretary of Agriculture, and its worth has already been clearly proven to the people of the Commonwealth in many directions. The old practice of selling adulterated feed has been abolished, and as a rule, the farmer and dairyman receives proportionately greater value for his money than ever before, while the live-stock fed upon such feed is correspondingly protected and benefitted. Samples of feeding stuffs are analyzed at a nominal cost of one dollar.

Hundreds of dealers and dairymen have applied to this Bureau for information relating to this subject, but their inquiries were referred to the Department of Agriculture where the same received the most careful and prompt attention.

A special bulletin showing the results of such investigations was issued by the Department for the information of all concerned. It is plainly evident that the composition of certain brands of cattle feeding stuffs has been materially changed and improved, and that the old era of adulteration with foreign and worthless ingredients has passed.

The act provides a penalty for violation of its provisions, and consequently a large number of prosecutions were ordered by the Secretary of Agriculture and conducted to a proper legal termination. The results of such prosecutions are most salutary, and local dealers in feeding stuffs are now using greater precautions to escape the penalties for handling adulterated or illegal brands. The law is of much value to all engaged in a legitimate business, while those who were accustomed to imposing upon the public have been halted and brought to judgment.

CLEAN AND WHOLESOME FOOD FOR COWS.

One of the many dairy subjects brought to the attention of the Dairy and Food authorities is the alleged feeding of swill to cows producing milk for public consumption. In a number of states, the laws covering this question are drastic, and absolutely forbid the feeding of any cow kept for the production of milk on swill or any substance in a state of putrefaction or rottenness; or on any substance of an unwholesome nature, or on any food or substance that may produce diseased or unwholesome milk.

While this matter very obviously comes under the direct control and regulation of local boards of health, as well as the rules and regulations of the State Department of Health, the Dairy and Food Bureau will always be glad to co-operate in the laudable work of improving milk supplies. Only a comparatively few years ago, but little if any attention was bestowed upon the matter of clean and wholesome food for cows. The sale of swill for feeding cows had attained large proportions, while other questionable food was not only supplied by home dealers but many carloads of objectionable and unwholesome feed were brought here from far-distant shipping points. The writer knows of at least one instance where the material delivered to a dairyman was completely rotten, the carload of a stinking, unhealthful mass of so-called feed for cattle being sold for less than freight charges and used for manure. Under the present improved conditions of dairying, cattle feed cannot be too good in quality, nor selected with too much care.

ERADICATING TUBERCULOUS COWS FROM HERDS.

The correspondence of the Dairy and Food Division has indicated more fully than ever before the trend towards the production of milk that is absolutely free from danger, so far as the bacilli of tuberculous cows is concerned. The dairymen are demanding a thorough inspection of their herds, and are anxious to weed out the diseased animals, not only for their own protection, but for the public good. The State Livestock Sanitary Board is in charge of such inspections, and there is no doubt as to the immense amount of good which their work has accomplished in behalf of humanity through the eradication of tuberculosis in some of the best herds in the State.

The Dairy and Food Division has united and co-operated in the difficult task of stamping out the disease from the dairy herds of Pennsylvania in every practicable manner, realizing the danger of infection, and also knowing that in many instances the physical appearance of the diseased animal is fully equal to the appearance of the average dairy cow that is entirely exempt from the disease. There is positive danger to public health so long as cows which react, whether strongly or otherwise, to the tuberculin test, are allowed to furnish milk, cream and butter for human consumption.

As the State Livestock Sanitary Board has tested thousands of animals with tuberculin, veterinarians are not in the least doubtful as to its value for a correct diagnosis, as it is almost infallible, although it may not always indicate to what extent the animal may be affected. Perhaps one of the most unpleasant features in connection with the consideration of the subject is the truth that a dangerously tuberculous cow, long after she has become dangerous, may continue to look and act like a healthy animal. The legislature of Pennsylvania is entitled to unstinted praise for the noble services and financial support rendered in behalf of this good work.

GUARDING ANIMAL PRODUCTS OF PENNSYLVANIA.

In view of the fact that it is said that over forty-five per cent. of the food consumption of the better classes in the United States consists of animal products, it is at once self-evident that its strict surveillance and inspection is of the greatest value and importance to the American people. That this laudable work is now being effectually done in Pennsylvania, speaks volumes of praise for the Commonwealth, and that its beneficient effects are already visible throughout the State is a statement that can readily be confirmed even by a casual examination.

The enactment of additional legislation covering the subject of animal products, and placing certain duties and responsibilities upon the officers of the State Livestock Sanitary Board, governing their sale, has brought about an era of improved food supplies that is greatly appreciated by the public. Although there was only a partial acquiescence to the new conditions at the outstart, and an indefinite or misleading interpretation of the law, the average butcher and dealer has learned that the authorities sworn to enforce these excellent laws are deeply in earnest, and that they must fully comply with the new regulations.

While the Dairy and Food Division also has powers in certain directions so far as the sale of meat products are concerned, there is a hearty and constant co-operation between the two bodies, and as both are working for the general welfare of the people, the consumer receives double protection against the sale of chemically preserved and decomposed meats.

Prof. H. P. Armsby, of the Pennsylvania State Experimental Station, reports that in Pennsylvania alone, the value of the animals slaughtered for food have an aggregate value of twenty and one-half million dollars, in addition to the millions of dollars worth of dressed meats that are imported. About sixteen million dollars worth of eggs and poultry are also consumed annually.

ENFORCING NEW MEAT LEGISLATION.

The Dairy and Food Bureau received various complaints during the year from correspondents, (many of them writing anonymously), about the alleged deplorable condition of local slaughter-houses, and the fact that they were a menace to the health of the people residing in the locality in which they were located, etc. Some of these allegations, apparently, were well founded.

While the large packing plants doing an interstate business are under direct government supervision and inspection, the smaller establishments are not under such inspection, nor were they under direct State or county supervision.

The offal was usually disposed of by depositing it in an adjoining corral where it soon became a breeding place for vermin and flies. No provisions were made for a proper cooling and refrigeration of the meat, while during the warm season, both dirt and flies covered the meat. The most serious evil, perhaps, consisted in the unwelcome truth that diseased cattle were too often slaughtered and sold to the unsuspecting patron as well-fed and healthy beef. Whether the animal was filled with tubercular bacilli or a victim of lumpjaw, (actinomycosis), was immaterial, so long as there was sale for the abominable stuff. Under these conditions, there was but little surprise when drastic laws were introduced into the legislature, providing for the regular and careful inspection of slaughter-houses and their products, neither was there any doubtful question as to such proposed laws being passed and approved. Dr. Leonard Pearson, Secretary of the State Livestock Sanitary Board was largely instrumental in securing the much desired legislation, and as His Excellency, Governor Stuart, was in entire sympathy, we now have on our statute books laws that have already completely revolutionized the fresh meat trade of the State.

The supervision of these establishments has wisely been placed under the care of the State Livestock Sanitary Board, and with a corps of intelligent veterinarians serving as Special Agents, a rigid inspection and corresponding good for the public health and welfare is fully assured. Consumers already notice the marked change in the meat supplies, and unite in their praise and commendation for the good that is being accomplished, while the complaints that now reach the Dairy and Food Bureau are rare. In bringing about these gratifying changes in the meat trade, the State Livestock Sanitary Board and the Dairy and Food Bureau have always co-operated most heartily and willingly.

IMPROVED BEEF SUPPLY OF PENNSYLVANIA.

With the dynamic energy of the agents of the State Livestock Sanitary Board making a thorough inspection of the slaughter and packing houses of Pennsylvania to prevent the sale of diseased meat and meat products, and with the special agents of the Dairy and Food Bureau constantly on the alert to prevent the sale of chemically preserved meat products, and both agencies working together harmoniously for the protection of the health of the public, no state in the Union can boast of a better meat supply than Pennsylvania. The people of Pennsylvania are enjoying business prosperity, and notwithstanding prevalent high prices, the demand for good, clean beef and meat products generally, is the largest in the history of the trade.

While some objected to an enforcement of the laws which prohibited the use of chemical preservatives in meats for preserving or brightening its appearance, the best portion of the trade are of the unanimous opinion that the law is a wise one, and that with its impartial enforcement, no harm can come to any legitimate dealer or business interest. The agents of the National Bureau of Animal Industry are also inspecting the Pennsylvania establishments, transacting an inter-state business, and it was soon found that many of the smaller butchering establishments in some of the smaller cities and towns were perhaps the most willful or indifferent violators of the laws, so far as the use of sulphites was concerned.

The Dairy and Food Bureau joined in this work most heartily, not to break down our business interests, but to give the trade still greater prestige, until the beef products of the State can only stand synonymous for cleanliness, purity and healthfulness.

THE MEAT SUPPLY OF PENNSYLVANIA.

Singular as it may appear, unconfirmed reports have reached the Dairy and Food Bureau at various times alleging that horse-meat was being palmed upon the public in certain sections of Pennsylvania for beef. It was claimed that horse-meat was being smoked and sold as dried beef, at a price considerably below that of the genuine article. While little credence was attached to such reports, special agents of the Bureau were detailed to make an investigation with the invariable result that reports came back to the effect that the informants had been deceived or misinformed.

In one instance it was reported that dried-beef was being sold by a well known merchant in a prominent town "at a price considerably below the normal price," but upon careful examination, it was discovered that the price was below its actual cost, and reduced to compete with a rival merchant who had reported the alleged wrong-doing.

While the figures indicate a constantly increasing consumption of meat in Pennsylvania, and the fact that the farmers of the State are feeding steers more extensively than for many former years, the magnitude of the farmer's occupation in adding to the store of this class of food is hardly appreciated by the average reader. Taking the United States figures as a criterion, it has been calculated that every time the clock ticks a second during ten hours of a work-day, the farmer drives nine meat animals to the butcher.

SULPHITES IN FRESH MEATS PROHIBITED.

The old and reprehensible practice of converting partially decomposed fresh meat into Hamburg steak, after the addition of a liberal portion of chemical preservatives, is fortunately no longer popular in Pennsylvania. Several years ago the practice was a very common one and prevailed among some of the largest and most reputable butchers. While apparently fresh, and the color of the meat being restored and heightened by the use of sulphites, physical changes of a dangerous character and menacing to health were in progress. The chemists reported that borax, boric acid and sulphite of soda were a frequent adulterant, and the Dairy and Food officials, as a rule, experienced but little difficulty in securing convictions. The leading authorities assert that the use of a chemical preservative agent on meat is most reprehensible, no matter what it may be, and that the Commonwealth of Pennsylvania performed a praiseworthy deed in stopping this abuse.

The average city meat market does no longer have in readiness for immediate delivery the usual large quantity of Hamburg steak to await forthcoming but uncertain customers. The old, familiar pile of highly colored and attractive "steak" is no longer in evidence, but the purchaser will be able to assist in selecting the meat he wants and will very properly watch the process of cutting and grinding the same while he waits. This method may be less profitable to the dealer, but is of far greater value to the consumer.

CHEMICALLY PRESERVED FRESH MEAT UNCOMMON.

One of the most beneficient results derived from the enforcement of the Pure Food Act of June 26, 1895, which was repealed by the Legislature of 1907, was the almost total elimination of the dangerous practice of using sulphites and other chemicals in fresh meat, sausage, bologna, Hamburg steak and in fact, in nearly all meat products. Canned meats were also very frequently found to be heavily "doped" with these pernicious chemicals, but as the warfare against their use continued, and after the arrest and punishment of hundreds of butchers and dealers in meat and meat products, there was a very perceptible and sensible decrease in the use of such deleterious materials for the purposes indicated.

The more recent investigations and consequent analytical examination of samples purchased in the open markets of Pennsylvania show a general compliance with the law. The new meat act (1905), under which such prosecutions are now being brought provides for a fine of not less than one hundred dollars, and the average dealer will therefore be averse to taking any further chances of detection, arrest and punishment.

The analyses of canned or tinned meats has also shown a marked change, and the vast meat industry is certainly in a much better and more healthful condition than ever before.

SAUSAGE DOPED WITH STARCH AND WATER.

One of the articles commonly found on sale in every butcher shop and in many stores, namely, sausage, is the subject of a special investigation that is now being made by the National and other pure food authorities. The manufacturers have been using starch and other material foreign in sausage in excessive quantities for years, and it has also developed that such foreign substances are added to enable the maker to add an abnormally and unwarranted large amount of water, thus giving the manufacturer profits that do not belong to him.

In Pennsylvania this subject received special consideration several years ago, and the prosecutions brought showed very conclusively that the same methods were being practiced here. After the imposition of a number of fines, these practices were reduced to a minimum, and later, analyses of numerous samples failed to show the former gross abuses. While some butchers may sit up and burn the midnight electricity (or oil), to devise devious methods to get rich quickly, the old plan of "watering" or "filling" sausage with starch and water is no longer safe.

The Dairy and Food authorities of Pennsylvania were among those to take the initiative move to stop these practices. Their efforts were effective and are now saving money for the poor people who are probably the largest consumers of sausage.

HOW TO HANDLE FRESH MEAT AND FISH.

In relation to the sale of fresh meat and fish, a rule was adopted and promulgated by this Bureau to the effect that such articles of food must at all times be kept in a pure, clean and healthful condition. In the summer season they must be covered or protected from flies and insects by screens or other devices, and kept at a temperature as will prevent decomposition.

Refrigerators and ice boxes for the storage of meats and fish must be kept well iced and clean, while stores, market houses and all rooms used for the storage or sale of meats and fish should be clean, properly ventilated and kept in a sanitary condition. When meat or fish are not so cared for it will be considered in violation of the laws, and the owners treated accordingly.

The conditions that prevailed in many sections of the State were extremely unsanitary, if not absolutely dangerous to the health of the public, and it is pleasing to note that there has been at least a partial observance of these new rules. It is also a noteworthy fact that these unpleasant conditions were not confined entirely to the slum sections of cities, but were found to exist in many unsuspected places, and where better things had been hoped for.

The Special Agents of the Dairy and Food Division are no respectors of persons, and abated such nuisances wherever found, regardless of the standing of the delinquent dealer. During the coming summer, special attention will be paid to this work, in connection with the joint efforts of the agents of the State Livestock Sanitary Board.

IMMATURE OR "BOB-VEAL" ILLEGAL.

The long mooted question as to securing legislation that would effectively prohibit the sale of immature or "bob-veal" has at last been answered in the affirmative, through the medium of the duties placed upon the State Livestock Sanitary Board. The sworn special agents of this Board are authorized to condemn, seize and confiscate any such veal or other unwholesome meat, and under such authority, has already brought about a change in many sections of the State that is appreciated. In a majority of cases, those who dealt in immature veal would pack the carcasses in barrels and boxes, and consign them to inter-state points. Under the new National laws, these dealers would also be liable to severe penalties, and where the same are carefully observed and enforced carcasses must now be accompanied by proper certificates, showing their origin, etc.

Several years ago, the shipments of "bob-veal" from this State into New Jersey and New York had reached large proportions. It was currently believed that the most of the shipments were converted into canned goods and sold as "potted canvas-back duck," "turkey" or "chicken."

The Dairy and Food officials are gratified because of this change, and doubly glad because of the fact that the work of inspection and consequent condemnation, if found unfit for food, has been placed under the careful scrutiny of skilled veterinarians. His Excellency, Governor Stuart, and Dr. Leonard Pearson, Secretary of the State Livestock Sanitary Board, acted most wisely in their conclusion that only graduate veterinarians should be appointed to fill the responsible positions as inspectors of the State Livestock Sanitary Board.

MINCE-MEAT IN PENNSYLVANIA.

The Dairy and Food Bureau corresponded with numerous parties in relation to the legality of various brands of mince-meat. It has been ascertained that very many of the so-called "mince meats" do not contain any meat, while in general, the meat contents are very inferior in quantity; in fact, it is said that very few of the mince meats sold in the stores contain more than 10 per cent. of meat. Suet and tallow are sometimes employed as a cheap filler as a substitute for the genuine meat, which apparently produces a better combination than that made without any such substance. Without meat, the name is most certainly a misnomer, and a fraud upon the buyer and consumer. Judged by the name alone, it appears that meat of some kind would be an indispensable factor in the composition.

Many of the brands of pressed mince-meat are a novelty in their make-up; but in the absence of any definite knowledge as to their sanitary character—and their effect upon health when used as a regular dietary, we will refrain from making any comments. One thing is quite certain: and that is the fact that the so-called commercial mince-meat does not as a rule approximate in quality that made by the house-wife of Pennsylvania, no matter if each such "manufacturer" has a method peculiarly her own.

Until quite recently there was scarcely a well-known brand that did not contain a chemical preservative; such as benzoate of soda, etc., while in a few instances, the product was improved in appearance by the use of artificial coloring matter. Some of the leading manufacturers are now manufacturing a better grade to meet the demand of the more fastidious customer.

THE SALE OF DRESSED POULTRY.

A visit to the market and stalls as well as stores in the larger cities and towns where dressed poultry is sold will be a revelation to some of the people of the rural districts who are accustomed to seeing and buying only live or freshly slaughtered poultry. It is said that there are thousands of fowls exposed for sale annually that were killed a year or two ago, and kept in cold storage, to await a rising or more satisfactory market. The writer saw fowls that came out of cold storage that were frozen solid, and upon being thrown around while being assorted and classified for sale, in some instances the frozen legs were broken off, through careless and rough handling. After removal from cold storage, some of the dealers dipped these fowls into water containing a peculiar chemical solution, to assist in restoring them to a more natural color, but the careful analysis of a number of specimens did not reveal the presence of harmful chemical preservatives.

The attention of the Dairy and Food Bureau has been called at various times to the badly decomposed condition of some of the dressed poultry offered for sale in certain places, but in a majority of cases, such matters were very properly placed under the care of the local health authorities, who are always on the spot and in the place where such violations occur.

Whether drawn or undrawn, poultry should be handled under the most sanitary conditions, and the sale thereof positively forbidden if there is the least indication of decomposition. This question is one of obvious importance to the housekeeper who will hail with delight any measure that will improve the present unsatisfactory condition of the average poultry market.

FINANCIAL STATEMENT.

The following financial statement showing the receipts of the Dairy and Food Division of the Department of Agriculture for the year 1907 is of special interest, since it reveals at a glance the importance and growth of this important and valuable branch of the public service. The figures are as follows:

RECEIPTS.

Oleomargarine Licenses,	$26,586 21
Oleomargarine Fines,	16,438 44
Pure Food Fines,	8,381 27
Renovated Butter Licenses,	2,369 17
Milk Fines,	1,015 86
Vinegar Fines	589 68
Renovated Butter Fines,	202 00
Meat Fines,	100 00
Lard Fines,	50 00
	$55,732 63

The entire sum above reported, namely, $55,732.63, was promptly paid into the State Treasury of Pennsylvania, for the use of the Commonwealth, as required by the provisions of the General Appropriation Act.

The aggregate receipts for the year 1907 compare favorably with former years. There is, however, a material decrease in the amount of fines collected for the violation of the pure food law, as compared with the preceding year. This fact is entirely due to the new pure food act which contains a number of provisos foreign to the act of 1895, which it supplants. The new law places the responsibility on the manufacturer, wholesale dealer or jobber, in cases where the retail merchant has exercised proper care and discretion in securing guarantees. As in many such cases the goods are traced to non-residents of the State, no further legal action can follow in Pennsylvania and the only course to pursue is to report the violations to the National authorities for their consideration and action.

Special attention has again been devoted to the illegal traffic in oleomargarine, and the amount of fines collected from that source, $16,438.44, is the largest in the history of the Dairy and Food Bureau.

The receipts from renovated butter licenses amounted to $2,369.17, while $202.00 was received from defendants who violated the law regulating its manufacture and sale in Pennsylvania.

EXPENDITURES OF THE BUREAU.

The expenditures of the Dairy and Food Division during the year 1907 amounted to $78,455.88, classified as follows:

EXPENDITURES.

Special Agents Salaries,	$20,491 86
Chemists Expenses,	17,588 37
Attorneys,	15,815 52
Agents Expenses,	14,543 78
Clerical and Stenographers Salaries,	10,016 35
	$78,455 88

TESTING THE NEW PURE FOOD LAW.

With the advent of new pure food laws, there is an inevitable tendency on the part of those adversely affected to contest and delay any prosecution that may be brought under its provisions. The work of the past few months merely confirms past experiences, and in consequence several important test cases are now pending in the courts to ascertain the true status and constitutionality of the new act.

As has already been stated under the new pure food act all prosecutions consist of a civil action to recover the nominal fine of $60 and costs, while under the former act, which was repealed, the defendants were arrested upon a criminal charge.

ADDITIONAL LEGISLATION NEEDED.

The past year's experience demonstrates the absolute necessity of securing additional legislation relating to the pure food laws of Pennsylvania. These proposed laws and such other changes as may be deemed necessary in order to make food legislation still more effective, will be formulated and presented for the legislative action at the proper time.

The Executive Committee of the Ice Cream Manufacturers' Association of Pennsylvania will co-operate with the Dairy and Food Division in preparing a suitable act of Assembly regulating the sanitary condition of ice cream factories, as well as all appliances, including cans, materials, etc., connected with the production of ice cream. The leading manufacturers are already producing their product under greatly improved sanitary conditions, and these parties are anxious that all factories and dealers shall be placed upon the same high level and thus assist in not only protecting the public health, but in upbuilding this growing and important industry through the medium of better goods.

The same committee will prepare an act fixing a certain standard for ice cream and plainly designating what it shall consist of. This step is also regarded with favor. While the right to manufacture imitation ice cream may be conceded, the right to sell it as a substitute for the genuine article is not conceded by the Department, and should be everywhere denied.

The extensive traffic in cold storage eggs has also led to trade evils and abuses that should not be tolerated. An act will be presented intended to regulate the sale of both storage eggs and poultry. The complaints received at the Department make this step a necessary one.

While the officials have no desire to interfere with any legitimate business, the public are entitled to protection against the impositions practiced by the less scrupulous dealers.

It is an absolute necessity that an act regulating the manufacture and sale of all kinds of non-alcoholic drinks should be introduced and passed during the coming session of the Legislature. The analytical examinations and reports made during the past year revealed more fully than words the harmfulness and worthlessness of many of the so-called "soft drinks" that are being sold so freely and generally throughout the State. It is a matter of special regret that innocent children are among the largest and best patrons of such harmful articles of drink.

That an act to regulate the manufacture and sale of all kinds of alcoholic drinks is needed needs no special comments. The experience of the Department several years ago forms its own commentary. The wholesale drugging of liquor has no doubt been resumed since the courts decreed that the Dairy and Food Commissioner had no special authority over the sale of adulterated articles of drink.

The Dairy and Food Commissioner has presented a formidable array of facts in connection with the dangerous ingredients and qualities of many of the so-called "soft drinks" to show the need for a law that would provide prompt and severe punishment for those who would poison the human system or assist in shortening life. Many of the samples secured and analyzed contained harmful acids that were positively inexcusable and a menace to the consumer.

It is also an indisputable fact that a large proportion of the alcoholic liquor that is being sold by dealers or dispensed over the bar is badly adulterated. While the Federal law may have acted as a retardant in a limited degree, the need for State supervision is none the less rigid. The legitimate liquor dealer will heartily sanction conservative and proper legislation that will aid in driving from the market adulterated and unwholesome articles of drink of whatsoever kinds or brands.

An act to regulate the sale of milk and cream, as has been repeatedly proven, is also needed and recommended. The Commissioner believes that a standard for butter-fat in cream should be established by law, and that this standard should be fixed at eighteen (18) per cent. The act should prohibit the sale of any milk containing any added water or milk from which any portion of the butter-fat has been abstracted.

NEW PURE FOOD LAW SHOULD BE AMENDED.

The Legislature will be asked to make a number of important changes in the Pure Food Act approved June 1st, 1907. These changes will not be urged for the mere sake of making changes, but they will be advocated for the reason that the experience of those in charge of the administration of the act in question shows that certain crudities and weaknesses exist which materially interfere with its proper and successful enforcement. The act primarily is intended for the protection of the consumer as well as for the benefit of the people, generally. The Commissioner concedes that the honest retailer is entitled to fair consideration, and will cheerfully recommend that those sections of the law which afford certain protection at the cost of the careless, indifferent or unscrupulous manufacturer or jobber shall be retained on the statutes.

STATEMENT SHOWING PROSECUTIONS IN 1907.

The official records of the Dairy and Food Bureau show that during the year 1907, 664 prosecutions were brought to a successful and final termination in the courts of the Commonwealth. These cases are reported in two divisions, namely, that part of the year during which my predecessor was in office, and that portion during which the present official was in charge.

TERMINATED PROSECUTIONS.

January 1st. to April 15th, 1907.

	Cases.
Renovated Butter Fines, Act 1891,	3
Oleomargarine Fines, Act 1901,	164
Milk Fines,	34
Vinegar Fines,	13
Pure Food Fines,	170
Lard Fines,	1
Cheese Fines,	0
Meat Fines,	1
Total,	386

April 15th to December 31st, 1907.

Renovated Butter Fines, Act 1901,	3
Oleomargarine Fines, Act 1901,	115
Milk Fines,	31
Vinegar Fines,	12
Pure Food Fines, Act 1895,	30
Pure Food Fine, Act 1907,	85
Lard Fines,	1
Cheese Fines,	0
Meat Fines,	1
Total,	278
Total number of cases terminated,	664

The financial statement appearing as a part of the annual report shows in detail the amount of fines collected and paid into the State Treasury for the use of the Commonwealth of Pennsylvania.

With the increased percentage of pure goods that is being proven by chemical analyses, there very naturally follows a decrease in the number of prosecutions for the sale of adulterated food products. This fact is the best possible evidence that can be produced in behalf of the argument that the work of the Division has again been successful, and that the public are receiving the protection to which they are fully entitled.

PROVIDING FOR CLEAN MILK CANS.

The act of Assembly approved May 25th, 1907, to require the thorough cleansing of the inside of cans and other vessels used in the shipment of milk or cream on railroads, has not fulfilled the expectations of its framers. The act is imperfect in several essential points, and should be amended during the coming session of the Legislature so as to make it more easy of enforcement. It is the consensus of opinion among dairymen, that its enforcement very properly should be placed under the administration of the Dairy and Food Bureau, and that the act should declare violations a misdemeanor and provide that the fines imposed and collected shall be paid into the State Treasury for the use of the Commonwealth, the same as all other fines imposed by the various dairy and food laws of the State.

THE MEASUREMENT OF MILK AND CREAM.

While the new act providing a legal standard of measurement for milk, skim-milk and cream has retarded if not entirely prevented the old-time juggling and imposition with such measures, the correspondents of this Division, with hardly any exception, are favorable to a proposed amendment so as to place the act under the administration of the Dairy and Food Bureau. This act should make it a criminal offence to defraud dairymen and others through the medium of false measures and provide that the fines should be paid to the Dairy and Food Division, and by him paid into the State Treasury.

While both of the aforesaid laws are of a highly meritorious character, the changes suggested would go far towards adding to their utility and practicability in securing the ends aimed at by their respective authors.

In concluding, the Commissioner desires to acknowledge the invariable courtesy and valued assistance received from His Excellency, Governor Stuart, and the hearty cooperation extended by Hon. N. B. Critchfield, Secretary of Agriculture. To all of the official force, including the special agents, chemists, attorneys and assistants, clerical and stenographic force, grateful acknowledgements are due for loyalty and a conscientious performance of their respective duties. To the press of Pennsylvania, especial thanks are extended for their entire fairness in presenting matters relating to this Bureau and for their moral support and encouragement.

The year was also characterized by an increased and more extended effort to conduct a campaign of liberal education, in order that the work of the Dairy and Food Bureau might be better understood by the public at large. The Commissioner has addressed numerous trade organizations, discussing the more complicated phases of the laws in detail, and officially, extended every possible courtesy to those who sought information through the medium of correspondence. That the work just begun may bring still better results for the people of this Commonwealth, is a sincere wish and earnest hope.

Very respectfully,

James Foust

Dairy and Food Commissioner.

REPORT OF THE STATE VETERINARIAN FOR 1907.

HARRISBURG, PA., *January 1, 1908.*

Hon. N. B. Critchfield, *Secretary of Agriculture, Harrisburg, Pa.:*

Sir: I have the honor to present in the following report on the work of the office of the State Veterinarian and upon the work of the State Livestock Sanitary Board for the year 1907.

The work of the State Livestock Sanitary Board continues to increase very rapidly. Fortunately, the last legislature provided for enlarging the staff of this office, without which it would be quite impossible to respond to half of the demands for help that are received from owners of livestock. Under the authorization of the act approved May 25th, 1907, a Deputy State Veterinarian has been appointed. The Department of Agriculture and the State are fortunate in having obtained in this connection the services of Dr. Louis A. Klein. Dr. Klein was appointed by the Governor, October 15th, 1907. His long experience in public veterinary work, under both State and Federal authority has enabled him to at once assume important responsibilities.

A large part of the executive work in connection with the administration of the law pertaining to meat hygiene falls to Dr. Klein. The meat hygiene service will be referred to later. It may be said in this place, however, that the law is working well and the further we proceed to carry it out the more evident becomes the necessity for it.

Two new diseases have been discovered in this State during the year. One of these, epizootic lymphangitis, is a disease of horses and the other, chronic bacterial dysentery, is a disease of cattle. These discoveries are of especial interest and importance because neither of these diseases has ever before been diagnosed in the United States, or, indeed, in any part of the American continent. It seems to be highly probable that both diseases exist in other states. It is creditable to the field and laboratory staff of the State Livestock Sanitary Board that the true nature of both of these infections have been recognized here in advance of such recognition in other states where the diseases prevail. The diseases are quite different in character, but both are essentially chronic. It is believed that sanitary measures can be conducted with success against both of these newly discovered infections now that the first step, that is the determination of their nature, has been made.

The subject of tuberculosis of cattle continues to be of great importance. There is growing interest among herd owners in reference to tuberculosis and public health officials are demanding more and more that this disease be exterminated among milk and meat producing animals. These combined influences lead to the utilization to the utmost of the resources of the State Livestock Sanitary Board that may be directed against tuberculosis.

Vaccination against tuberculosis has received a large amount of study at the laboratory and at the experimental farm of the State Livestock Sanitary Board. Many methods for vaccinating cattle against tuberculosis have been tried. Some of these are original, others are as used elsewhere. A commercial tuberculosis vaccine that is widedly advertised has been experimented with, among others. It has been found that the claims made for the commercial vaccine are exaggerated and misleading. The method that has been developed at the experimental farm that has given best results has been used in a considerable number of breeding herds and is being employed more each year.

The vaccine that is used in our practical work on farms consists of a living tubercle virus, the organism being of human type and very attenuated. This virus is incapable of infecting cattle. It is administered by intravenous injection. A second vaccination is made with a larger dose six weeks after the first vaccination and a third vaccination is made after a similar interval. Experiments have shown that the immunity that results from such treatment is of high grade and is sufficient to protect animals under conditions of unusually severe exposure to intimate contact with extensively tuberculous cows. The resistance so produced may be depended on for a period of approximately two years. Some animals so vaccinated retain their resistance for a considerably longer period. It appears, however, that the limit of dependable immunity from the method that is used at this time is around four months. This period is long enough to be of considerable practical value. For instance, if one is endeavoring to re-organize, on a healthy basis, a breeding herd that has been found to be more or less extensively infected with tuberculosis, it may not economically be possible, or desirable, to dispose immediately of all infected animals, and to thoroughly disinfect the premises requires considerable time.

If, under such circumstances, the young and as yet uninfected cattle in the herd can be protected from infection for a couple of years, this allows time to re-organize the herd, to place buildings in sanitary condition and to bring the young cattle into profit. Vaccination would, of course, be very much more useful if its effects were of greater duration. If an animal could be immunized for life against tuberculosis it would be most useful. Von Behring and his commercial agents originally claimed, in advance of sufficient trial, that his method would immunize cattle against tuberculosis for life. It has since been found that these claims are without warrant. Hutyra has shown that animals that he immunized by the Von Behring method with "bovovaccine," lost their immunity at the expiration of about twelve months or less. Since artificial immunity will not last for life we need a method to restore or to renew the resistance of an animal that has been once vaccinated and that is gradually outgrowing its resistance to tuberculosis. Since the vaccine that is used contains the living virus, it is considered undesirable to use it on cows in milk or on heifers or cows that within a short time will be in milk. It has not been demonstrated that the tuberculosis vaccine is eliminated through the udder of a cow in lactation but, nevertheless, to be on the safe side, such a vaccine as is now commonly in use should not be used on cows that are in milk or cattle that will furnish milk within three months of the last vaccination. In fact, to be entirely on the safe side, and beyond any possibility of criticism, it is our practice to restrict vaccination to young cattle and to heifers that have not yet been bred. We need now to develop a system of re-vaccination that does not involve the use of a virus that is at all pathogenic for man. The experiments that we have made do not encourage the belief that immunity may be restored by the use of dead bacilli, extracts of tubercle bacilli or any kind of non-vital material. The most encouraging outlook is found in the use of living, a virulent tubercle bacilli. It is necessary that extended experiments shall be made along this line. The results that have already been shown in relation to the vaccination of cattle against tuberculosis are of much practical value and enourage the hope that the method may still further be improved and its value increased.

There have been requests from some of the public institutions of the State, as insane hospitals, where herds of cattle are maintained, that the State Livestock Sanitary Board shall, through its agents, take charge of the hygiene of the herd and be responsible for the prevention of infectious diseases. It has never been possible for this office to assume any such responsibility for the reason that our staff and our funds are entirely too limited. If it is necessary to select between the use of the funds of the State Livestock Sanitary Board for the protection of a farmer's herd or of a herd belonging to the State, the benefit of the decision would be given the private farmer, on the basis that the institutions in charge of herds are supplied with State funds for the care and protection of such herds, while the private farmer is without public relief, excepting as it may be afforded through the State Livestock Sanitary Board. This office has, however, always been ready to respond so far as possible to calls for assistance from such institutions and where it has appeared that there was reason for an inspection at the expense of the State such an inspection has always been made, and the institution has been supplied with such help and information as may have been appropriate for the purpose of controlling infectious diseases of animals and of preventing subsequent loss. Under these circumstances, the herd of the State Lunatic Hospital at Harrisburg was tested in 1897. It was found that the herd was practically saturated with tuberculosis. The herd was disposed of by slaughter and a new herd was organized; the premises were cleaned and disinfected and the new herd was subsequently retested and was left, in 1900, under healthy conditions without any evidence of tuberculosis. During the latter part of 1906, a request was again received from the superintendent of the State Lunatic Hospital for an inspection of the herd. The inspection was made by an agent of the Board, Dr. Enoch Barnett. It was found that a number of cattle showed well marked physical signs of advanced or general tuberculosis denoting long existing disease, and upon the tuberculin test it was discovered that most of the cattle in the herd were infected in some degree. Further investigation showed that evidence of tuberculosis had existed in this herd for several years and that a number of tuberculous cows had been removed from this herd from time to time for as long as three years. Of course it is well known that a cow is likely to excrete tubercle bacilli for a long time, possibly for months, before the disease becomes so advanced that the constitution of the cow is so broken down as to give rise to marked, physical signs of disease. Hence, it is clear that this herd has been exposed to tuberculosis to an unknown but probably to a considerable extent, for as long as three years prior to the report received in December 1906. This case is here referred to for the purpose of emphasizing the necessity for extreme watchfulness and care of such an important herd (as indeed, of any herd) and the importance of reporting the herd for test immediately when the first animal with tuberculosis is found. In this case the disease was permitted to spread for as long as three years before the report was made and during this time the herd was being riddled with the disease and ruined. Large experience justifies the statement that it is very probable that if this herd had been tested with tuberculin when the first affected animal was found, it would have been discovered that the infection was not widespread and it could have been extirpated without serious loss.

Under provision made by the last Legislature, an additional piece of ground, comprising about 50 acres, upon which there is an old house and barn, have been purchased for use in connection with the farm of the State Livestock Sanitary Board in Delaware county. This provides a farm of about 200 acres. Some temporary provision has been made for buildings that are needed for the care of experimental animals and for the conduct of the work of the farm. The plans for permanent buildings are not completed and will be reported upon at a future time. The location of the farm and the terrain are admirable for the purpose in view. There are many important problems that concern the livestock interests of the State that can now be studied with the aid of such an equipment as is here provided.

The maintenance of a successful animal industry in Pennsylvania is of very great importance to the entire Commonwealth. The most lasting asset among the natural resources of the State is the soil. The forests and the mineral deposits are being exhausted. After the important deposits of mineral are gone the soil should still be in condition to support a large population. The maintenance of the fertility of the soil depends on a conservative system of agriculture, but no system of agriculture can be carried out with reference to the improvement of the soil alone; it must be profitable. It has been found by centuries of experience, and this empirical knowledge is confirmed by the scientists of agricultural colleges and experiment stations, that it is necessary to keep farm animals to consume a considerable part of the products of the fields in order to supply manure to keep up the fertility of the land, and in order to make profitable any extensive system of conservative field management. Of course, animals do not yield a maximum profit if they are not efficient examples of their kind and if they are not in good working condition; that is, in health. When the broad relations of these facts are grasped it will be evident that the work of veterinarians is of fundamental importance in relation to the proper economic development and the conservation of the natural resources of the country. In addition to this economic side of the veterinarian's work, there are the public health relations that have been referred to in previous reports and that are so obvious that it is not necessary to discuss them in detail now. They relate chiefly to the prevention of the spread of disease from animals to man and to the hygiene of foods of animal origin. These facts emphasize the importance of the work that falls to this office.

The State Livestock Sanitary Board is now called upon and, as time passes, is continually being called upon more, for assistance in purifying the sources of the milk supply. Unfortunately, it has not been possible to attend to this work as systematically as is demanded by its importance. It is believed that provision for additional development in this direction is desirable.

EXPENDITURES. For the fiscal year ending May 31st, 1907, the State Livestock Sanitary Board had available $45,000.00 for its general work in repressing diseases of animals. Expenditures under this fund may be classified as follows: for tuberculous cattle, $20,232.40; for inspecting tuberculous cattle and in herds, $3,670.59; for horses afflicted with glanders, $5,255.00; for inspections for the suppression of disease other than tuberculosis, for vaccination, etc., $5,581.27; for the cost of enforcing quarantines, for material used in making tuberculin, for making and shipping tuberculin, for the diagnosis of specimens, etc., $3,173.70; for office and miscellaneous expenses, $5,318.33; for the enforcement of the law requiring the inspection of cattle from other states, $1,768.71.

The work of the Board should be expanded in other directions, but its growth is held in check, as by an iron band, by the funds that are available for its support. *Very much more money should be paid to farmers for tuberculous cattle than is now paid.* It is not possible, however, to do this under the present financial limitations. The amount paid for cattle this year is about $8,000 less than last year. More than $2,000.00 was paid for glandered horses during the past fiscal year in excess of the amount paid the year before. Considering the importance of the animal industry of Pennsylvania, the amount of capital invested and the need of veterinary sanitation, the funds provided have been exceedingly meagre and very much less in proportion than in many other states, as in New York, New Jersey and Massachusetts. In Massachusetts, the appropriation for the state veterinary medical work is about $80,000.00 a year, which is equivalent to an appropriation of about $400,000.00 in Pennsylvania as we have in this state about five times as many cattle and about five times the area of Massachusetts.

It is gratifying to report that, with the approval of Governor Stuart, the last legislature has made more adequate appropriation for the support of the work of this office.

The following laws relating to the work of the State Livestock Sanitary Board, and collateral work, have been enacted since the publication of the last report:

AN ACT

To encourage the breeding of horses; to regulate the public service of stallions; to require the registration of stallions; and to provide for the enforcement thereof.

Section 1. Be it enacted, &c., That every person, firm or company standing or traveling any stallion for breeding purposes, in this State, shall cause the name, description and pedigree of such stallion to be enrolled by the State Livestock Sanitary Board, and procure a certificate of such enrollment from said Board, which shall thereupon be presented to and recorded by the prothonotary of the county or counties in which said stallion is used for public service.

Section 2. In order to obtain the license certificate herein provided for, the owner of such stallion shall file a certificate of soundness signed by a duly qualified veterinarian, or, in lieu thereof, he may make oath before a notary public that, after diligent inquiry, such stallion is, to the best of his knowledge, free from hereditary, contagious, or transmissible unsoundness or disease, and shall forward this veterinarian's certificate, or his affidavit, together with the stud-book certificate of registry of the pedigree of the said stallion, and any other documents that may be necessary to define and describe his breeding and ownership, to the State Livestock Sanitary Board.

Section 3. The officers of the State Livestock Sanitary Board, whose duties it shall be to examine and pass upon the merits of each pedigree submitted, shall use as their standard for action the stud-books and signatures of the duly authorized presidents and secretaries, respectively, of the various horse pedigree registry associations, societies, or companies recognized by the United States Department of Agriculture; and shall accept as pure bred, and entitled to a license certificate as such, each stallion for which a pedigree registry certificate is furnished, bearing the signature of the president and secretary of a stud-book recognized and approved by the United States Department of Agriculture.

Section 4. Stallions afflicted with hereditary, contagious, or transmissible unsoundness or disease may be refused license by the State Livestock Sanitary Board; and when license is so refused, the said stallion shall not be used for public service for profit or gain in this State: Provided, however, That a license may be refused, under this section, only when it is certified to the Board by the State Veterinarian that the stallion in question is afflicted with an hereditary, contagious, or transmissible unsoundness or disease of such a nature, or that the abnormal condition is accompanied by such a defect of conformation, as to render it probable that the progeny of the said stallion will be especially liable to said unsoundness or disease. Blemishes and deformities due to accidents shall not be regarded as unsoundness, within the meaning of this act.

Section 5. The owner of each stallion standing for public service in this State shall post, and keep affixed during the entire breeding season, copies of the license certificate of such stallion, issued under the provisions of the next succeeding section, in a conspicuous place both within and upon the outside of the main door leading into any stable or building where the said stallion stands for public service.

Section 6. The license certificate issued for a stallion whose sire and a dam are of pure breeding, and the pedigree of which is registered in the stud-book recognized by the United States Department of Agriculture, shall be in the following form:—

Commonwealth of Pennsylvania,
State Livestock Sanitary Board.

Certificate of Pure Bred Stallion, Number ....
The pedigree of the stallion (name), ...
Owned by, ...
Described as follows:
(Color), ..., (Breed), ...

Foaled in the year ...., has been examined; and it is hereby certified that the said stallion is of pure breeding, and is registered in a stud-book recognized by the United States Department of Agriculture.

(Signature), ...
Secretary of the State Livestock Sanitary Board.

The license certificate issued for a stallion whose sire or dam is not of pure breeding shall be in the following form:—

Commonwealth of Pennsylvania,
State Livestock Sanitary Board.

Certificate of Grade Stallion, Number ....
The pedigree of the stallion (name), ...
Owned by, ...
Described as follows:
(Color) ....

Foaled in the year ...., has been examined; and it is found that the said stallion is not of pure breeding, and is therefore not eligible for registration in any stud-book recognized by the United States Department of Agriculture.

(Signature), ...
Secretary of the State Livestock Sanitary Board.

The license certificate issued for a stallion whose sire and dam are pure bred, but not of the same breed, shall be in the following form:—

Commonwealth of Pennsylvania,
State Livestock Sanitary Board.

Certificate of Cross-bred Stallion, Number, ...
The pedigree of the stallion (name), ...
Owned by, ...
Described as follows:
(Color) ....

Foaled in the year ...., has been examined; and it is found that his sire is registered in the ...., and his dam in the .... Such being the case, the said stallion is not eligible for registration in any stud-book recognized by the United States Department of Agriculture.

(Signature), ...
Secretary of the State Livestock Sanitary Board.

Section 7. Every bill, poster, or advertisement issued by the owner of any stallion enrolled under this act, or used by him for advertising such stallion, shall contain a copy of its certificate of enrollment.

Section 8. A fee of one dollar shall be paid to the State Livestock Sanitary Board, for the examination and enrollment of each pedigree; and an additional fee of one dollar for the issuance of a license certificate, in accordance with the breeding of the stallion, as above provided, which license shall expire in one year and must be renewed annually.

Section 9. The State Livestock Sanitary Board is authorized to establish needful regulations, and to provide for official examination upon voluntary request from owners of stallions, and to issue certificates of approval of stallions that are approved in respect to purity of breeding, soundness, conformation, breed-type, and the suitability to improve the horse stock of the State.

Section 10. Upon a transfer of the ownership of any stallion enrolled under the provisions of this act, the certificate of enrollment may be transferred to the transferree by the State Livestock Sanitary Board, upon submittal of satisfactory proof of such transfer and upon payment of the fee of fifty cents.

Section 11. The fees paid to the State Livestock Sanitary Board, under the provisions of this act, shall immediately be covered into the State Treasury, for the use of the Commonwealth.

Section 12. Violation of any of the provisions of this act shall be punished by a fine, not exceeding fifty dollars, to be paid to the Secretary of the Livestock Sanitary Board, and by said Secretary to be paid into the Treasury of the Commonwealth, for the use of the Commonwealth.

Section 13. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed. This act shall take effect, and be in force from and after January first, one thousand nine hundred and eight.

Approved—The 25th day of April, A. D. 1907.

EDWIN S. STUART.

No. 132.

AN ACT

To amend section one of "An act providing for necessary medical attention to needy persons who may be in danger of suffering from hydrophobia," approved the thirty-first day of March, Anno Domini one thousand nine hundred and five, so as to include all persons who may apply for aid, and providing that the cost of such medical attention shall be paid by the several poor-districts within this Commonwealth.

Section 1. Be it enacted, &c., That section one of "An act providing for necessary medical attention to persons who may be in danger of suffering from hydrophobia," approved the thirty-first day of March, Anno Domini one thousand nine hundred and five, which reads as follows:

"Section 1. Be it enacted, &c., That in each and every county of this Commonwealth it shall be the duty of the proper officers of the several poor districts, in such counties, to provide all *needy* persons, in their said several districts, who may be bitten by dogs suffering from hydrophobia, or rabies, with the proper medical attention to prevent the development of the disease in the person or persons so bitten, which medical attention may include the treatment known as the Pasteur treatment," be altered and amended so as to read as follows:

Section 1. Be it enacted, &c., That in each and every county of this Commonwealth it shall be the duty of the proper officers of the several poor districts, in such counties, at the expense of such poor districts, respectively, *to provide all persons who may apply for aid* in their said several districts who may be bitten by dogs or *other animals* suffering from hydrophobia, or rabies, with the proper medical attention to prevent the development of the disease in the person or persons so bitten, which medical attention may include the treatment known as the Pasteur treatment.

Approved the seventh day of May, A. D., 1907.

EDWIN S. STUART.

No. 186.

AN ACT

To require the thorough cleansing of the inside of cans, and other vessels, used in the shipment of milk or cream on railroads.

Section 1. Be it enacted, &c., That all cans or other vessels, used in the shipment of milk or cream on railroads, shall be thoroughly cleansed of the refuse of milk or cream, and other foreign matter, in, or adhering to the inside of, such can or other vessel, before shipment, and re-shipment of same back to the original shipper thereof.

Section 2. Any person or persons who shall fail to neglect to cleanse the cans or other vessels as provided for in Section 1 of this act shall be liable to a penalty, not exceeding fifty dollars, for each and every violation of this act, to be reported in the name of the Commonwealth, as debts of equal amount are by law recoverable, by any person or persons who may sue for the same. All moities or fines shall be paid into the county treasury of the respective counties of the Commonwealth where suit is brought; to be paid to the treasurer of the county where such suit shall have been brought.

Section 3. In default of the payment of the penalty recovered as provided for in section 2 of this act, the person or persons against whom such penalty is recovered shall be committed to the jail of the proper county, for as many days as the penalty recovered is in dollars.

Approved the 25th day of May, A. D., 1907.

EDWIN S. STUART.

No. 187.

AN ACT

To protect the public health by providing for the prevention of the preparation and sale of meat and food products which are unsound, unhealthful, unwholesome, and otherwise unfit for human food; defining what shall be regarded as meat and meat food products; authorizing the appointment and compensation of local meat inspectors; authorizing the State Livestock Sanitary Board to enforce the provisions of this act, to make rules and regulations for its enforcement, and to appoint agents to assist in its enforcement; and to provide penalties for the violation or perversion hereof.

Section 1. Be it enacted, &c., That the State Livestock Sanitary Board is hereby authorized to organize and to administer, in accordance with the provisions of this act, a service for the purpose of protecting the consumers of meats from injury by diseased, contaminated, putrid, or otherwise unsound unhealthful, or unwholesome meats or meat food products, unfit for human consumption. The State Livestock Sanitary Board shall formulate and promulgate rules and regulations for the disposal of the carcasses of diseased animals. So far as they are applicable and are approved, the meat inspection regulations of the United States Department of Agriculture may be adopted and promulgated by the State Livestock Sanitary Board.

Section 2. No person, firm, or corporation, or any officer or agent of such person, firm or corporation, shall sell, offer for sale, expose with intent to sell, or prepare for use as human food, any meat or meat product from an animal that is in such condition that its flesh is unsound, unhealthful, unwholesome, or otherwise unfit for human food. Nor shall any unsound, unhealthful, or unwholesome meat or meat product be sold, or offered for sale, or exposed with intent to sell, for use as human food, or be manufactured or prepared for use as human food.

The terms meats and meat food products, wherever used in this act, shall include and apply to all carcasses, or parts of carcasses, of cattle, sheep, swine and goats, and the meat or meat food products thereof.

Section 3. The owners, lessees, occupiers, or managers of all abattoirs, slaughtering, packing, butchering, meat-canning, meat manufacturing or rendering establishments, and of places or vehicles where meat is prepared, stored, sold, or transported, shall keep such establishments, places, and vehicles in a wholesome, clean and sanitary condition.

Section 4. The Governor is hereby authorized and empowered to appoint ten persons to serve as agents to assist in the enforcement of the provisions of this act. Such agents shall have knowledge of the diseases of meat producing animals, and shall be versed in the conditions that affect the soundness, healthfulness, and wholesomeness of animal food products. An appropriate standard of fitness for appointees to these offices shall be established and maintained by the State Livestock Sanitary Board.

Section 5. Agents of the State Livestock Sanitary Board, as provided for in section four of this act, shall receive a salary of one thousand eight hundred dollars per year, and their actual necessary traveling expenses while engaged in the proper duties of their office: Provided, however, That such expenses shall not exceed one hundred dollars per month.

Section 6. It shall be the duty of agents of the State Livestock Sanitary Board, as provided in this act, to perform such services prescribed by this act as may be imposed by authority of the State Livestock Sanitary Board. Such agents are authorized, without let or hindrance, to enter upon any premises, or to enter any place, building, vehicle, or vessel, used for the storage, preparation, or transportation of animals or their products, and to examine, in any way that may be necessary, any animals, meats, or meat food product there found, for the purpose of determining whether such animals, meats, or meat food products are, or may be, made into sound, wholesome, and healthful human food. Animals, carcasses, or parts thereof, that are unsound, unhealthful, unwholesome, or otherwise unfit for human food, shall be rejected or condemned, and said animals, carcasses, or parts or products thereof, shall be treated and disposed of in such a way that they cannot be used as human food, as shall be provided by the rules of the State Livestock Sanitary Board.

Section 7. It shall be the duty of the agents of the State Livestock Sanitary Board, as provided by this act, to make examinations of slaughtering, packing, meat-canning, rendering, or similar establishments, and of places where meats or meat food products are manufactured, prepared, stored, or sold, for the purpose of ascertaining whether the said establishments or places are constructed, arranged, equipped, managed, or cared for in such a way as injuriously to affect the soundness, healthfulness, or wholesomeness, or otherwise to render unfit for human food, the meats or meat food products therein prepared, stored, or sold. In case the establishment, or the manner in which it is arranged, equipped, managed, or cared for, shall be found to be defective in such particulars as to make it probable that, by virtue of such defect or defects, the meats or meat food products may be rendered unsound, unhealthful, unwholesome, or otherwise unfit for human food, it shall be the duty of the agent of the State Livestock Sanitary Board to notify the owner, occupier, or manager thereof as to the nature of the particular defects found, and report the same to the State Livestock Sanitary Board. The said Board shall thereupon send to the owner, occupier, or manager of the defective establishment or place a notice, in writing, in which the defect or defects shall be described; and the owner, occupier, or manager shall thereupon, within reasonable time, remedy, remove, or abolish the said defects. In the case that a defect in respect to the construction, arrangement, equipment, management, or care of a slaughtering, packing, meat-canning, rendering, or similar establishment, or of a place where meat or meat food products are manufactured, prepared, stored, or sold, deemed by the State Livestock Sanitary Board to be of such a nature as to render it probable that the meat or meat food products therein prepared, stored, or sold may, by virtue of said defect, be rendered unsound, unhealthful, or unwholesome, or otherwise unfit for human food, is not removed or abolished within reasonable time, to be designated by the State Livestock Sanitary Board, after notice from the said Board, the said establishment or place may be closed; and the owner, occupier, or manager thereof, and all other persons, are forbidden to use the said establishment or place for the preparation, storage, or sale of meats or meat food products until the said defect is remedied, removed or abolished in a way that is approved by an authorized agent of the State Livestock Sanitary Board.

Section 8. All cities and boroughs, and all townships of the first class, are authorized and empowered to provide for the appointment of local meat-inspectors, as may be required, and to fix their compensation, which shall be paid from the funds of the city, borough, or township of the first class. The qualifications of such local meat-inspectors shall be certified by the State Livestock Sanitary Board, and they shall have the same authority and duties as are, by this act, conferred on agents of the State Livestock Sanitary Board, and shall be subject to the same rules and regulations. Such certificates of qualification may be withdrawn or revoked at any time by the State Livestock Sanitary Board, for incompetency or neglect of duty. Local meat-inspectors shall have jurisdiction only within the limits of the city or borough, or township of the first class, by and for which they are appointed. Such local meat-inspectors shall not be governed by ordinances, rules or regulations that are incompatible with, or that conflict with, provisions of this act, or with the rules or regulations for the guidance of its agents, approved and promulgated by the State Livestock Sanitary Board.

Section 9. The State Livestock Sanitary Board may, under such rules and regulations as it may adopt, not incompatible with the acts of Assembly or the Constitution of the Commonwealth, appoint local agents to examine the animals, carcasses, meats, and meat food products, used, prepared, or stored in local slaughtering, packing, canning, rendering, or similar, establishments, and to affix an approved stamp or mark to the meats and meat food products that are found to be sound, healthful, wholesome, and fit for human food. The meats and meat food products that are found to be unsound, unhealthful, unwholesome, or otherwise unfit for human food, shall be rejected or condemned, and disposed of so that they cannot be used for human food, in the manner provided by the rules and regulations of the State Livestock Sanitary Board. Such agents shall report to, and they may be transferred or dismissed by, the State Livestock Sanitary Board. They shall be subject to the provisions of this act, and to the regulations governing and for the guidance of agents of the State Livestock Sanitary Board.

The funds for the compensation of such local agents as are provided for in this section of this act shall be furnished by the owner or manager of the establishment that such agent is appointed to oversee, and upon whose request this form of inspection is established. The funds for the payment of such local agents shall be deposited by the owner or manager of such establishment, to his own credit, in some bank or trust company to be designated by the State Livestock Sanitary Board; and shall be paid out upon the cheque of such owner or manager, payable to the order of the local agent entitled to compensation, after the bill of such local agent for services has been approved by authority of the State Livestock Sanitary Board, and the cheque, so drawn for said compensation, has been approved by authority of said Board: Provided, That such agents as are provided for by this section of this act shall be appointed only upon request of the persons or firms who agree to meet such expense. Employes of the United States Department of Agriculture, engaged in the inspection of animals, meats, and meat food products, may be appointed agents of the State Livestock Sanitary Board, and be clothed with the powers of such agents: Provided, however That such employes of the United States Department of Agriculture shall receive no pay or compensation for such service as agents of the State Livestock Sanitary Board.

Section 10. The State Livestock Sanitary Board shall make arrangements for cooperation between the laboratory of the Board and those engaged in the examination and inspection of meat producing animals and meats, so that unusual or difficult diseases and conditions may be scientifically studied and accurately diagnosed for the benefit of the meat inspection service.

Section 11. The State Livestock Sanitary Board may, from time to time, make such regulations for the enforcement of this act as may be necessary to carry its provisions into force and effect, and, so far as is compatible with the purposes of this act, the plans, regulations, and methods of the meat-inspection service of the United States Department of Agriculture shall constitute the standard to be adopted and followed. And the meat inspection work of the United States Department of Agriculture shall not be repeated or duplicated by the agents of the State Livestock Sanitary Board, nor by local meat-inspectors: Provided, That the provisions of this act shall not apply to animals slaughtered by any farmer on the farm, and sold or transported to market as meat or meat food products; nor to retail butchers and retail dealers in meat or meat food products, supplying their customers. But this proviso shall not prevent agents of the State Livestock Sanitary Board or local meat-inspectors from inspecting such premises, animals, meats, or meat food products, at any time. And if any such person shall sell, or offer for sale or transportation, any meat or meat food products which are diseased, unsound, unhealthful, unwholesome, or otherwise unfit for human food, knowing that such meat food products are intended for human consumption, or shall keep his establishment, salesplace, or vehicle in unsanitary condition, after official notice being served, he shall be guilty of a misdemeanor.

Section 12. No person shall make, duplicate, reproduce, forge, or counterfeit any stamp, certificate, mark, or emblem used or authorized to be used by the State Livestock Sanitary Board for marking or designating animals, carcasses, meats, or meat food products that have been approved or condemned; and no such stamp, certificate, mark, or emblem, used by or authorized to be used by the State Livestock Sanitary Board, shall be used or employed without specific authority so to do from the State Livestock Sanitary Board.

Section 13. Any agent of the State Livestock Sanitary Board, or any local meat-inspector appointed by authority of the said Board, or any local meat-inspector appointed by any city, borough, or township of the first class, who shall pass or approve any meat or meat food product that is unsound, unhealthful, unwholesome, or otherwise unfit for human food, or who shall fail to perform his duties as prescribed by this act, or who shall accept any money, gift or other thing of value from any person, firm, or corporation, or officers, agents or employes thereof, given with intent to influence his official action, shall be deemed guilty of a misdemeanor, and shall, upon conviction thereof, be summarily discharged from office, and shall be punished by a fine of not more than five hundred dollars, or by imprisonment not exceeding one year, or by both such fine and imprisonment.

Any person, firm, or corporation, or any agent or employe of any person, firm, or corporation, who shall give, pay, or offer, directly or indirectly, to any agent, officer, or inspector authorized to perform any of the duties prescribed by this act, or by the rules and regulations of the State Livestock Sanitary Board, any money or other thing of value, with intent to influence said agent, officer, or inspector in the discharge of any duty herein provided for, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine not exceeding five hundred dollars, or by imprisonment not exceeding one year, or by both such fine and imprisonment.

If any person shall sell or offer for sale, or offer for transportation to market, any meat or meat food product which is diseased, unsound, unhealthful, unwholesome, or otherwise unfit for human food, knowing that such meat or meat food product is intended for human consumption, he shall be guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine not exceeding five hundred dollars, or by imprisonment for a period not exceeding one year, or by both such fine and imprisonment.

Any person, firm, or corporation, or any officer or agent of such firm or corporation, who shall violate any of the provisions of this act shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine not exceeding five hundred dollars, or by imprisonment not exceeding one year, or by both such fine and imprisonment.

Section 14. All fines and penalties arising from violations of any of the provisions of this act shall be paid to the State Livestock Sanitary Board, and shall be immediately paid by said Board to the State Treasurer, for the use of the Commonwealth.

Approved—The 25th day of May, A. D., 1907.

EDWIN S. STUART.

No. 195.

AN ACT

Supplemental to an act, entitled "An act to establish a Department of Agriculture, and to define its duties and to provide for its proper administration," approved the thirteenth day of March, Anno Domini one thousand eight hundred and ninety five; to provide for the appointment of a Deputy State Veterinarian, a clerk, and a stenographer, and to fix their salaries.

Section 1. Be it enacted, &c., That in addition to the officers and employes provided for by the act to which this is a supplement, there may be appointed by the Governor, for the term of four years, a Deputy State Veterinarian, at an annual salary of twenty-one hundred dollars, ($2,100.00); and there shall be appointed by the State Veterinarian a clerk, at an annual salary of twelve hundred dollars ($1,200.00), and a stenographer at an annual salary of nine hundred dollars ($900.00.)

Approved—The 25th day of May, A. D., 1907.

EDWIN S. STUART.

No. 261.

AN ACT

Supplementary to "An Act for the taxation of dogs and the protection of sheep," approved the twenty-fifth day of May, Anno Domini one thousand eight hundred and ninety-three; requiring all dogs to wear a collar, to be provided by the owner, together with a tag to be attached thereto showing payment of tax; imposing certain duties upon constables, tax collectors and county commissioners; and providing for the killing of dogs whose owners fail to comply with this act and the act to which this is a supplement.

Section 1. Be it enacted, &c., That hereafter all dogs, made taxable by the act to which this is a supplement, shall be required to wear, at all times, a substantial collar, to which shall be attached the tag hereinafter mentioned; said collar to be furnished by the owner of said dog or dogs; and said tag to be furnished by the county commissioners, and to be paid for by them, out of the funds realized from the taxation of dogs.

Section 2. The county commissioners of the several counties shall prepare and furnish, annually, to the several tax collectors of the counties metal tags, to be given by the tax collectors to the owners of dogs when said owners shall pay the tax assessed upon said dogs. Upon one side of said tag shall be stamped, in raised letters, the following "Dog tax for .... (naming the year), paid."

Section 3. At the time of payment of dog tax by the owner of such dog, the tax collector shall give the said owner one of said tags, prepared for the year for which said tax is paid, which said tag shall thereupon be attached to the collar of the dog for which said tax was paid by the owner of said dog.

Section 4. Should the owner of any dog or dogs neglect to pay the tax assessed for said dog or dogs, and to comply otherwise with the provisions of this act during the year for which said tax is assessed, it shall immediately there-after be the duty of the proper tax collector to give notice, either written or verbal, to said owner that if he fails to pay said tax, and also to comply with the provisions of sections 1 and 3 of this act as to the collar and tag required to be worn, within ten days or to kill his dog himself within said time, that said dog will thereupon be killed by the constable of the proper district.

Section 5. In case of default by any such owner as to complying with the requirements of such act, and particularly with section 4 as to payment of tax, wearing collar and tag, killing his said dog, it shall thereupon be the duty of the tax collector of said district and shall be the right and privilege of any citizen of the proper district, to notify the proper constable of the said district of such failure and default, and that it thereupon becomes the duty of such constable to kill said dog. And in either case, it shall thereupon be the duty of such constable to kill all such dogs; and for such service said constable shall be entitled to receive for each dog killed by him from the county commissioners, out of the fund realized for the taxation of dogs, the sum of fifty cents.

Section 6. Every person keeping a dog or dogs about his house or premises, permitting such dog or dogs to stay about his house or premises, shall be taken and deemed to be the owner of such dog or dogs for all the purposes of this act.

Section 7. All acts or parts of acts inconsistent herewith be and the same are hereby repealed.

Approved—The first day of June A. D. 1907.

EDWIN S. STUART.

MEAT HYGIENE. The meat hygiene service was commenced by the appointment of three agents of the State Livestock Sanitary Board who were instructed to make a preliminary survey of the meat supplies of the State for the purpose of gathering information that would be of use in formulating plans for the formal inauguration of this new work. The three men selected for this preliminary investigation were Dr. George B. Jobson, Franklin, Venango county; Dr. Otto G. Noack, Reading, Berks county and Dr. T. E. Munce, Washington, Washington county.

It was learned as a result of this investigation, and otherwise, that approximately one-half of the meat supply of Pennsylvania is derived from animals killed in slaughter houses located within the State. The other half of the meat supply is derived from establishments located outside of Pennsylvania. Under the Federal meat inspection law all animals killed in slaughter houses engaged in interstate trade are under the inspection of agents of the United States Department of Agriculture. This inspection consists in the examination of animals before they are killed and an examination at the time the animals are slaughtered and the carcasses dressed. By this means, diseased animals are very easily discovered and they and their products may be, and are eliminated from the meat supply. Establishments engaged in interstate trade and under Federal meat inspection can be operated only when a Federal meat inspector is actually present, so that all the animals killed and all of the processes for preparing meat for market may be inspected and supervised. This scrupulous oversight was found to be necessary on account of the dangerous and disreputable practice of some establishments. All meats prepared in establishments under Federal inspection are stamped in such a way as to denote that they have been inspected and passed by Federal authority.

Part of the slaughter houses in Pennsylvania are engaged in interstate trade, that is, they market some of their products outside of the State, and so they come under Federal inspection. The number of such establishments under Federal inspection in Pennsylvania is as follows: Allentown, 1; Chester, 3; Harrisburg, 6; Norristown, 2; Philadelphia, 36; Pittsburg, 6; Pottsville, 2; Saegertown, 1; Scranton, 1.

The total number of slaughter houses in Philadelphia is 157. There are approximately 100 slaughter houses in Pittsburg, and every county in the State has a number of local establishments supplying local trade. These local establishments whose market is entirely within the State of Pennsylvania are not engaged in interstate trade and, therefore, cannot be regulated by Congress, and do not fall under the supervision of the United States Department of Agriculture.

A few cities carry a certain limited amount of meat inspection. In Philadelphia, for example, there are five city inspectors to supervise 142 local slaughter houses, while there are 15 slaugher houses engaged in interstate trade and under Federal inspection, need thirty-five men to conduct the kind of inspection that Congress has repuired. In Pittsburg there is one city meat inspector; and in other cities health officers or food inspectors do a little meat inspection work. Outside of the few municipalities that have made provision for this sort of work, there is no systematic meat hygiene service excepting that under the direction of the State.

LIVESTOCK SANITARY BOARD. It is clear that the field of work for this Board is large. Some of the local slaughter houses are in very bad condition. It has been the practice all over the State, in the rural districts, to feed hogs on slaughter house offal. This is objectionable because it turns the vicinity of the slaughter house into a filthy pig pen, leading to the contamination of the building itself and the products therein prepared, and stored, and it is objectionable because many diseases with which food producing animals may be affected are by this means transmitted to hogs to whom their entrails are fed. Where hogs are fed on the premises it is quite impossible to keep a slaughter house and its surroundings in the sanitary condition that should be maintained. Tuberculosis and parasitic diseases are the conditions that are most likely to be transmitted to hogs through the feeding of slaughter house offal.

The fact that certain slaughter houses in other states and in Pennsylvania, are under careful Federal inspection, and that diseased animals slaughtered in such establishments are sure to be detected and condemned, has the effect of turning animals that are suspected during life of being diseased to slaughter houses other than those under Federal inspection. Numerous positive instances are known wherein animals suspected, or known, to be diseased have been purchased for slaughter in local establishments after they have been refused by the buyers of federally inspected establishments. This is a condition that renders necessary the establishment of a State meat hygiene service.

It is most unfair to the consumers of meats and to the tax payers to spend $3,000,000 for meat inspection under the auspices of the United States Department of Agriculture and create the impression that there is an efficient meat inspection throughout the country, and then to permit entrance to the market of a large quantity of products from diseased animals that are killed under no inspection at all. Morover, it is unfair to slaughtering establishments that are conducted in accordance with reasonable requirements of meat hygiene, to allow the sale in competition with products in such an establishment, of diseased and dangerous meats from uninspected establishments. The slaughter houses under Federal inspection have to sell their products in the same market and in competition with the products of establishments that are under no restriction. To exact these necessary hygienic requirements and to inflict the expense and loss that come from the improvement of establishments and the condemnation of animals and products upon a certain set of meat purveyors and to accept without question, and to place under no restriction, the products of another set of meat purveyors, is irrational and unjustifiable. A good deal of this irregularity and danger to the public are now overcome and conditions are being equalized so far as possible by the meat hygiene service of the State Livestock Sanitary Board.

It was evident that a very large part of the work that would fall upon the agents of the State Livestock Sanitary Board in the meat hygiene service would have to do with questions as to the healthfulness of animals and the wholesomeness of their products. The diagnosis of disease, both in the living animal and in the slaughtered carcass, are among the most important duties of a meat inspector. Meat inspection has been called "applied pathology," and it is necessary for a meat inspector to know the signs and significance of the evidences of diseases of animals. It was realized that wherever a condemnation of meat is made by a State agent the agent should be able fully to sustain his action and to testify in court, if necessary, against expert evidence, and to show the reason and the hygienic necessity for the action that he had taken. The conditions governing the work of the meat inspectors are quite different from those governing the food inspector. The former has to decide by his own knowledge, whether in a given case, material should be condemned or passed. The food inspector, on the other hand, confines himself largely to the collection of samples which are submitted to a chemist for examination and decision. If condemnation is ordered, it is on the basis of the evidence of the chemist. In this case the chemist is the real expert and the so-called food inspector is an assistant or a collector of samples to the chemist. It appears, therefore, that the meat inspector combines the functions of the so-called food inspector and of the chemist to whom the samples are referred. Meat inspection, as a science, is taught only in veterinary colleges, and it is only in such colleges that the pathology and symptomatology of the diseases of animals as required by meat inspectors are taught.

On these grounds, and following the precedent of the United States Department of Agriculture, and of all other important meat hygiene services, it was decided by the State Livestock Sanitary Board that the candidates for appointment as agents in the meat hygiene service should be required to show evidence of competency as veterinarians. Care was exercised to select only such men as had special, expert knowledge of this work. The staff, as it is now organized, consists of the following:

A. O. Cawley, Milton, Northumberland county.
H. R. Church, Luzerne, Luzerne county.
G. M. Graybill, East Petersburg, Lancaster county.
D. E. Hickman, West Chester, Chester county.
George B. Jobson, Franklin, Venango county.
Philip K. Jones, Pittsburg, Allegheny county.
C. C. McLean, Meadville, Crawford county.
T. E. Munce, Washington, Washington county.
O. G. Noack, Reading, Berks county.
J. H. Turner, Wellsboro, Tioga county.

These agents are engaged entirely in meat hygiene work. Most of their time, at present, is being devoted to a systematic examination of all the slaughter houses of the State. The purpose of these visits is to ascertain and point out such defects as may be found in the construction, care and equipment of the establishments. So far as possible, visits are made to slaughter houses when slaughtering is in progress and the animals being killed are examined. Moreover, markets are visited with the view of investigating their conditions and improving them, if requisite.

The work is too young to justify a statement as to its effect on the public health and the meat trade. It is being received favorably by the public and by the well meaning slaughterers and butchers. A great many more or less serious insanitary conditions have been found. Many of these have been due to ignorance rather than to wilful neglect or design. Owners are usually willing to act upon the recommendation of the agents, and advice and criticism is usually received in the same friendly spirit in which it is offered. A statistical report as to the operation of this service will be presented in due course.

Perhaps reference should be made here to the importance of having work of this character conducted by men who are thoroughly informed, not only as to the hygienic and sanitary results that it is desired to attain, but who also understand the technical methods that are practical and feasible and who are in sympathy with the livestock and slaughtering industries as well as with the requirements of public health. The staff of the State Livestock Sanitary Board is impressed by the importance of developing the agricultural and slaughtering industries of the State. It would be possible to make regulations so stringent as to seriously hamper the development of the local slaughtering industries. The effort is to establish such requirements as are demanded in the interest of public health and to endeavor to place the local slaughtering business in position to compete successfully with western competitors. If inspection were confined, as before this State service was founded, to the products of establishments engaged in interstate trade, local establishments would soon lose reputation and their business would dwindle in proportion as reputation declines. The establishment of a meat hygiene service, the requirements of which are sufficient to protect public health and which are attainable to progressive local slaughterers will, it is hoped, have the effect of enlarging the market for home-killed meats and this, in turn, will enlarge the market for food producing animals raised on Pennsylvania farms.

To show the position that is taken by the State Livestock Sanitary Board with regard to the various problems that enter into the questions of meat hygiene, the following rules and regulations governing the meat hygiene service are presented. These are adopted by the State Livestock Sanitary Board under authority of the act of Assembly approved May 25th, 1907. (P. L. 187.)

RULES AND REGULATIONS GOVERNING THE MEAT HYGIENE SERVICE.

RESPONSIBILITY OF OWNERS, MANAGERS, ETC.

1. Owners, lessees, occupiers or managers of all abattoirs, slaughtering, packing, meat-canning, meat manufacturing or rendering establishments, and of places or vehicles where meat is prepared, stored, sold, or transported, are required by law to construct, arrange, equip, manage and care for such establishments in such a manner that the meats or meat products therein prepared, stored or sold shall not be injuriously affected as to soundness, healthfulness, or wholesomeness, nor otherwise rendered unfit for human food. The terms "meats" and "meat products," wherever used in these regulations, shall include and apply to all carcasses, or parts of carcasses of cattle, sheep, swine and goats, and the meat or meat food products thereof.

2. No person, firm or corporation, or any officer or agent of such person, firm or corporation, shall sell, offer for sale, expose with intent to sell, or prepare for use as human food, any meat or meat product from an animal that is in such condition that its flesh is unsound, unhealthful, unwholesome or otherwise unfit for human food. Nor shall any unsound, unhealthful or unwholesome meat or meat product be sold, or offered for sale, or exposed with intent to sell, for use as human food, or be manufactured or prepared for use as human food.

CONSTRUCTION AND SANITATION OF BUILDING.

3. Buildings used for slaughtering, packing, canning or manufacturing meat or meat products shall not be used as dwellings, or places of residences, nor for any purpose that may have a tendency to affect injuriously the meats or meat products therein prepared. If any part of the building is used as a permanent stable for animals, there shall be no avenue of communication

within the building between the stable and the room used for the preparation of the meat or meat products, but pens for animals about to be slaughtered may be maintained in connection with the slaughtering room. Manure from such stables or pens shall not be stored adjacent to the buildings used for slaughtering, storing or preparing meats or meat food products, nor at any place on the premises or in such a manner as to bring about unsanitary conditions.

4. All buildings used for such purposes, and for storing or selling meats or meat products, shall be properly fitted and equipped for the purpose used, and shall be so managed and cared for that the meats and meat products prepared therein may not be rendered unclean, unsound, unhealthful or unwholesome, or otherwise unfit for human food.

(a) Floors shall be smooth and impervious and so laid that they will drain freely and rapidly into a drain and, when possible, this drain shall be connected with a sewer. No low or broken places beneath, or in, which fluid or solid refuse may lodge shall be allowed to exist.

(b) Walls of rooms in which animals are slaughtered or meat stored shall be tight, smooth, free from projections or crevices for the accumulation of filth, and shall be kept in a cleanly condition. Ceilings, partitions and pillars shall also be kept clean by brushing, spraying or washing. Frequent whitewashing or painting of walls, ceilings, pillars and partitions is desirable.

(c) All wagons, trucks, trays and other receptacles, all tables, chutes, platforms, racks, etc., and all knives, saws, cleavers, meat grinders, sausage fillers, scalding kettles and all other tools, utensils and machinery used in slaughtering, moving, handling, cutting, chopping, mixing, canning, or other process, shall be thoroughly cleansed daily, if used.

(d) Aprons, smocks or other clothing of employes coming in contact with meat shall be of a material that is readily cleansed and made sanitary, and shall be kept clean. All employes who handle meats or meat products shall be required to keep their hands free from filthy or infectious matter.

(e) All rooms in which meats or meat food products are prepared, stored, packed, canned, manufactured, or otherwise handled shall be lighted and ventilated in a manner acceptable to this Board or its agent, and shall be so located that odors from toilet rooms, catch basins, casings departments, tank rooms, offal or refuse heaps, hide cellars, etc., do not permeate them. All cooling and storage rooms or ice boxes shall if possible have a system of ventilation which permits the entrance of fresh clean air from outside the building.

5. Rooms used for the slaughter of animals shall be thoroughly cleansed at the close of each day's work. All offal and other refuse shall be removed and the floors and walls shall be flushed and washed. Where water-pipe connections can be obtained they shall be equipped with faucets and hose sufficient for proper cleansing. Toilet facilities adequate for the cleanliness and convenience of the employes shall be provided and shall consist of water-closets, urinals, wash basins, soap and clean towels. Such toilet rooms shall not communicate directly or indirectly with any rooms in which animals are killed or meats stored. The voiding of urine upon the floor of the slaughter house is prohibited.

6. Suitable receptacles shall be provided for blood, offal and similar materials, and such materials shall be put into the offal tank, or, where such tank is not available, removed from the premises as soon as possible, but under no circumstances shall they be permitted to accumulate for more than one day in summer or two days in winter. In no case shall they be permitted to accumulate in or around the slaughter house. The feeding of hogs or other animals on the slaughter house refuse shall not be permitted on the premises, and no use incompatible with proper sanitation shall be made of any part of such premises.

Receptacles and vehicles used for storing and transporting such materials shall be kept clean. Stomach and intestinal contents and other refuse shall not be allowed to accumulate on the floor of the slaughtering room and shall not be stored on the premises at any place or in such a manner as to render the conditions unsanitary.

Cribs or pens for the storage of bones shall not be located within nor adjoining any building used for slaughtering, storing or preparing meats or meat food products.

Hides or pelts shall not be stored on the floor of any room used for slaughtering, storing or preparing meats or meat food products, but shall be stored in a room set apart for such purposes.

7. Meats and meat food products intended for rendering into edible products must be prevented from falling on the floor or coming in contact with any dirty or disease producing material.

8. Persons afflicted with tuberculosis, or any other communicable disease, shall not be employed, or work in, any of the departments of establishments where carcasses are dressed, or meats handled or exposed for sale, and any employe showing evidence of being so affected shall be reported to the State Livestock Sanitary Board and to the manager or owner of the establishment by any agent of the Board or any local meat inspector appointed by authority of the Board who may discover the conditions.

STORAGE AND TRANSPORTATION OF CARCASSES.

9. Carcasses must not be permitted to hang in the slaughtering room longer than necessary, but shall be removed promptly to the cooling room to be kept under proper refrigeration.

Dressed carcasses shall not be transported on the public highways, exposed to contamination by street dust and insects. Vehicles for the conveyance of such carcasses shall be covered or shall be provided with wrappers of canvas, or equally satisfactory material. in which the carcasses shall be completely enveloped while in transit, and such wrappers shall be kept clean. Carcasses or parts of carcasses shall not be allowed to hang outside of markets, shops or stores exposed in such a manner as to become contaminated by dust or dirt.

10. Carcasses or parts of carcasses shall not be inflated with air blown from the mouth or otherwise. Skewers shall not be held in the mouth previous to inserting them in carcasses or parts of carcasses.

WHEN DISEASED CARCASSES ARE DRESSED.

11. Butchers who may have dressed diseased carcasses shall cleanse their hands of all grease and then immerse them in a prescribed disinfectant. and then rinse them in clear water before engaging again in dressing or handling healthy carcasses. All butcher's implements that have been used in dressing diseased carcasses shall be cleansed of all grease and then sterlized either in boiling water or by immersion in a prescribed disinfectant, and rinsed in clear water, before being again used in dressing healthy carcasses.

The premises on which diseased animals may have been killed shall be thoroughly cleansed, and, if necessary, they shall be disinfected, as required by the State Livestock Sanitary Board, an agent of the same, or any local meat inspector appointed by authority of the Board.

12. Separate trucks, etc., shall be furnished for handling disease carcasses and parts. Following the slaughter of an animal affected with an infectious disease a stop shall be made until the implements have been cleansed and disinfected, unless another set of clean implements are at hand.

CLEANLINESS OF ESTABLISHMENTS.

13. All parts of establishments used for slaughtering, packing, canning, manufacturing or storing meats or meat products, and the stables and pens used for livestock shall be kept in a cleanly, wholesome condition. They shall be especially cleansed and scrubbed and disinfected, and painted or whitewashed when required by authority of the State Livestock Sanitary Board, an agent of the same, or any local meat inspector appointed by the authority of the Board.

DUTIES AND AUTHORITY OF AGENTS OF THE BOARD.

14. Agents of the State Livestock Sanitary Board are authorized by law to make examinations of slaughtering, packing, meat-canning, rendering, or similar establishments, and of places where meats or meat food products are manufactured, prepared, stored or sold, for the purpose of ascertaining whether the said establishments or places are constructed, arranged, equipped, managed or cared for in such a way as injuriously to affect the soundness, healthfulness or wholesomeness, or otherwise to render unfit for human food, the meats or meat food products therein prepared, stored, or sold.

DEFECTS IN ESTABLISHMENTS.

15. Whenever an establishment, or the manner in which it is arranged, equipped, managed or cared for, shall be found to be defective in such particulars as to make it probable that, by virtue of such defect or defects, the meat or meat food products may be rendered unsound, unhealthful, unwholesome or otherwise unfit for human food, it shall be the duty of the agent of the State Livestock Sanitary Board to notify the owner, occupier or manager thereof as to the nature of the particular defects found, and report the same to the State Livestock Sanitary Board.

PENALTY FOR FAILURE TO REMEDY DEFECTS.

16. In case such defects are not removed or abolished within the time designated by the State Livestock Sanitary Board, after notice in writing from the Board, the said establishment or place may be closed; and the owner, occupier, or manager thereof, and all other persons, forbidden to use the said establishment or place for the preparation, storage, or sale of meats or meat food products until the said defect is remedied, removed, or abolished in a way that is approved by an authorized agent of the State Livestock Sanitary Board.

DISPOSAL OF CONDEMNED MEATS OR MEAT PRODUCTS.

17. Agents of the State Livestock Sanitary Board are also authorized to examine, in any way that may be necessary, any animals, meats, or meat food products found in such establishments, for the purpose of determining whether such animals, meats, or meat food products are or may be made into sound, wholesome and healthful human food. Animals, carcasses or parts thereof, that are unsound, unhealthful, unwholesome or otherwise unfit for human food, shall be rejected or condemned, and said animals, carcasses, or parts or products thereof, shall be treated and disposed of as follows:

(a) Where an offal tank is immediately available, the lower opening shall be first sealed by an agent of the State Livestock Sanitary Board or an authorized local meat inspector, then the condemned carcasses, parts, or meat food products shall be placed therein, in the presence of such agent or local meat inspector, after which the upper opening shall be sealed by the said agent or local inspector, whose duty it shall be to see that a sufficient force of steam is turned into the tanks and maintained a sufficient time to render the contents unfit for any edible product. Tanks for this purpose shall be so located that the fumes and odors therefrom shall not pervade the rooms in which carcasses are dressed or stored, or meat food products prepared.

(b) Where an offal tank is not available, the condemned carcasses, parts, or meat products shall be slashed with a knife, or otherwise disintegrated, and shall then be saturated with a solution of coloring matter to be provided by the State Livestock Sanitary Board, or with kerosene, in such a manner as to destroy them for food purposes.

METHOD OF DISPOSING OF SUSPECTED ANIMALS.

18. Any cattle, sheep, swine or goats showing symptoms or suspected of being affected with any disease or condition which, under these regulations would probably cause their condemnation when slaughtered, shall be marked at the time of examination by affixing to the ear a numbered metal tag bearing the words "Quarantined. Pennsylvania Livestock Sanitary Board," and said tag shall remain on the animal until it is slaughtered. No animal so marked or tagged shall be slaughtered for meat or be rendered into meat food products, except under the supervision and with the permission of an agent of the State Livestock Sanitary Board, or an authorized local meat inspector, nor shall it be disposed of in any other manner, except by permission of the Board or an agent of the same.

Any agent affixing such a tag to an animal shall make a report of the number of the same, together with a description of the animal, the location of the same and the name of the owner and his address, to the State Livestock Santary Board, and any agent of this Board or authorized local meat inspector supervising the slaughter of such an animal shall send the tag to the State Livestock Sanitary Board with a report of the conditions found and the disposition made of the carcass and other parts.

AUTHORITY OF AGENTS TO ENTER ESTABLISHMENTS OR PREMISES.

19. Agents of the State Livestock Sanitary Board are authorized, without let or hindrance, to enter upon any premises, or to enter any place, building, vehicle, or vessel used for the storage, preparation or transportation of animals, or their products, for the purposes of making such examinations as are defined in these regulations.

LOCAL MEAT INSPECTORS.

20. Whenever any city, or borough, or township of the first class, shall appoint and provide for the compensation of local meat inspectors the qualifications of such local meat inspectors, if found satisfactory, shall be certified by the State Livestock Sanitary Board, and they shall then have the same authority and duties as are by law conferred on agents of the State Livestock Sanitary Board, and shall be subject to these rules and regulations. Such certificates of qualification may be withdrawn or revoked at any time by the State Livestock Sanitary Board, for incompetency or neglect of duty. Local meat inspectors shall have jurisdiction only within the limits of the city, or borough, or township of the first class, by and for which they are appointed. Such local meat inspectors shall not be governed by ordinances, rules, or regulations that are incompatible with, or that conflict with, these rules and regulations of the State Livestock Sanitary Board or the law under which they are made.

APPOINTMENT OF LOCAL AGENTS FOR ESTABLISHMENTS.

21. Upon the written application of owners or managers of such establishments the State Livestock Sanitary Board will appoint local agents to make complete examination of all animals, carcasses, meats, and meat food products, used, prepared, or stored in local slaughtering, packing, canning, rendering, or

similar establishments, and to affix an approved stamp or mark to the meats and meat food products that are found to be sound, healthful, wholesome, and fit for human food.* The meats and meat food products that are found to be unsound, unhealthful, unwholesome, or otherwise unfit for human food, shall be rejected or condemned, and disposed of as provided in these regulations. Such agents shall report to and they may be transferred or dismissed by the State Livestock Sanitary Board. They shall be subject to the regulations governing, and for the guidance of agents of the State Livestock Sanitary Board, and to the law under which they are made.

The funds for the compensation of such local agents shall be furnished by the owner or manager of the establishment that such agent is appointed to oversee, and upon whose request this form of inspection is established. The funds for the payment of such local agents shall be deposited by the owner or manager of such establishment to his own credit, in some bank or trust company to be designated by the State Livestock Sanitary Board, and shall be paid out upon the cheque of such owner or manager, payable to the order of the local agent entitled to compensation, after the bill of such local agent for services has been approved by authority of the State Livestock Sanitary Board, and the cheque so drawn for said compensation has been approved by authority of said Board. Employes of the United States Department of Agriculture, engaged in the inspection of animals, meats and meat food products, may be appointed agents of the State Livestock Sanitary Board, and be clothed with the powers of such agents: Provided, however, that such employes of the United States Department of Agriculture shall receive no pay or compensation for such services as agents of the State Livestock Sanitary Board.

MISUSE OF STAMPS OR MARKS.

22. No person shall make, duplicate, reproduce, forge or counterfeit any stamp, certificate, mark, or emblem, used or authorized to be used by the State Livestock Sanitary Board for marking or designating animals, carcasses, meats, or meat food products that have been approved or condemned; and no such stamp, certificate, mark, or emblem, used or authorized to be used by the State Livestock Sanitary Board, shall be used or employed without specific authority so to do from the State Livestock Sanitary Board.

LABORATORY DIAGNOSIS.

23. Agents of the State Livestock Sanitary Board and authorized local meat inspectors shall forward specimens from any case of any unusual or peculiar disease that may be encountered in the course of their work to the laboratory of the Board in order that such disease may be scientifically studied and accurately diagnosed for the benefit of the meat hygiene service.

BRIBERY.

24. Any agent of the State Livestock Sanitary Board, or any local meat inspector appointed by authority of the said Board, or any local meat inspector appointed by any city, borough, or township of the first class, who shall pass or approve any meat food product that is unsound, unhealthful, unwholesome or otherwise unfit for human food, or who shall fail to perform his duties as prescribed by the law relating to the same, or who shall accept any money, gift, or other thing of value from any person, firm, or corporation, or officers, agents or employes thereof, with intent to influence his official action, shall be summarily discharged from office, and shall be prosecuted as provided by law.

25. Any person, firm or corporation, or any agent or employe of any person, firm or corporation, who shall give, pay or offer, directly or indirectly, to any agent, officer or inspector authorized to perform any of the duties prescribed by the rules and regulations of the State Livestock Sanitary Board, or the law under which they are made, any money or other thing of value, with intent to influence said agent, officer or inspector in the discharge of any duty therein provided for, shall be prosecuted as provided by law.

SALE OR TRANSPORTATION OF UNSOUND OR UNWHOLESOME MEAT.

26. If any person shall sell or offer for sale, or offer for transportation to market, any meat or meat food product which is diseased, unsound, unhealthful, unwholesome or otherwise unfit for human food, knowing that such meat or meat food product is intended for human consumption, he shall be prosecuted as provided by law.

27. Any person, firm or corporation, or any officer or agent of such firm or corporation, who shall violate any of the rules and regulations of the State Livestock Sanitary Board, or any of the provisions of the law under which they are made, shall be prosecuted as provided by law.

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*With the limited staff at its disposal, the State Livestock Sanitary Board will be unable to arrange for the continuous supervision of individual establishments and for the complete examination or marking of all the meats or meat food products prepared therein, except as provided in this rule.

EXAMINATION OF ANIMALS, DRESSED CARCASSES, MEAT FOOD PRODUCTS, ETC.

In establishments where, as provided in rule 21 of these rules and regulations, a local agent is stationed to examine all animals slaughtered and all meats and meat food products prepared therein, the examination, slaughter, preparation, marking and storing of all carcasses, parts or organs, and the disposal of all diseased carcasses, parts, or organs, shall be conducted in accordance with the following rule and regulations. The terms "establishment at which complete inspection is maintained" refers to such establishments. These rules and regulations shall also apply to all establishments where meats or meat food products are prepared or stored and shall be enforced by agents of the State Livestock Sanitary Board wherever they are present to conduct such examination, but the absence of such agent shall not be an excuse for the preparation or sale of unsound, unhealthful or unwholesome meat or meat food products, or for disregard of these regulations or of the law relating to meat hygiene.

ANTE-MORTEM EXAMINATIONS.

28. An ante-mortem examination shall be made of all cattle, sheep, swine and goats about to be slaughtered before they shall be allowed to enter the slaughtering room of an establishment at which complete inspection is maintained. Such examination shall be made in pens, alleys or chutes of the establishment at which the animals are about to be slaughtered. Owners or managers of such establishments shall provide satisfactory facilities for conducting such examinations and for separating or holding apart from healthy animals those showing symptoms of disease. All animals showing symptoms or suspected of being affected with any disease or condition which, under these regulations, would probably cause their condemnation when slaughtered, shall be marked by affixing to the ear a metal tag as provided in rule 18 of these regulations. All such animals, except as hereinafter provided, shall be slaughtered separately, either before regular slaughter has commenced or at the close of the regular slaughter, and shall be duly identified by a representative of the establishment to the agent of the State Livestock Sanitary Board or authorized local meat inspector on duty in the slaughter room before the skins are removed or the carcasses opened for evisceration. Reports on such animals shall be made by the agent or local meat inspector as provided in rule 18. Animals tagged for pregnancy which have not been exposed to any contagious or infectious disease are not required to be slaughtered, but before any such animal is removed from the establishment the tag shall be detached by the agent or local meat inspector on duty in said establishment and returned with his report to the State Livestock Sanitary Board. Animals commonly termed "downers" or crippled animals, shall be tagged, as provided in rule 18, in the abattoir pens for the purpose of identification at the time of slaughter, and shall be passed upon in accordance with the regulations.

POST-MORTEM EXAMINATIONS.

29. The agent or local meat inspector on duty in the establishment shall make a careful examination of all animals at the time of slaughter. The head, tail, thymus, gland, bladder, omentum, and the entire viscera, and all parts and blood used in the preparation of meat food products, shall be retained in such manner as to preserve their identity until after the post-mortem examination has been completed, in order that they may be identified in case of condemnation of the carcass. Suitable racks or metal receptacles shall be provided for retaining such parts.

Each establishment at which complete inspection is maintained shall be given an official number, and shall be indicated by said number on all official reports, stamps, marks, labels, etc.

Carcasses and parts thereof found to be sound, healthful, wholesome and fit for human food shall be passed, and in establishments where complete inspection is maintained they shall be stamped or marked by an agent of the State Livestock Sanitary Board as follows:

Upon each dressed beef carcass examined as above and passed there shall be placed by an authorized representative of the State Livestock Sanitary Board at the time of examination ten stamps or marks bearing the words "Examined and Passed. Pa. Livestock Sanitary Board," and the official number of the establishment.

Upon the dressed carcasses of sheep, swine and goats examined as above and passed there shall be placed by an authorized representative of the State Livestock Sanitary Board at the time of examination, a stamp or mark on each quarter bearing the words "Examined and Passed. Pa. Livestock Sanitary Board," and the official number of the establishment.

Should any lesion of disease or other condition that would probably render the carcass, or any part or organ, unfit for food purposes be found on postmorten examination such carcass, part, or organ, shall be marked immediately with a tag bearing the words "Condemned. Pennsylvania Livestock Sanitary Board." Carcasses, parts, or organs, so marked shall not be washed or trimmed and should not be placed in the cooling room or in the refrigerator or ice box with carcasses, parts or organs that have been passed. Such carcasses shall be promptly disposed of as provided in rule 17 of these regulations.

30. The carcasses, parts, or organs, of all animals which are slaughtered at an establishment where complete inspection is maintained, and which are found at time of slaughter or at any subsequent examination to be affected with any of the diseases or conditions named below, and all carcasses, parts, or organs, found to be so affected in any establishment examined, shall be disposed of according to the section of this rule pertaining to the disease or condition existing. As it is impracticable to formulate rules covering every case and to designate at what particular stage a condition becomes loathsome or a disease noxious, it is to be understood that the decision as to the disposal of all carcasses, parts, or organs, not specifically covered by these regulations shall be left to the discretion of the veterinarian making the examination, the decision in such cases to be based upon the nature, location and extent of the pathological conditions present and upon the principles of meat inspection as prescribed by Ostertag and other authorities.

(a) Anthrax.—All carcasses showing lesions of anthrax, regardless of the extent of the disease, shall be condemned and immediately tanked, as provided in rule 17, or properly buried or burned, incluing the blood, hide, hoofs, horns, viscera and all other portions of the animal. The place where the animal was slaughtered shall be disinfected with a 10 per cent. solution of formalin and all tools, implements, etc., which have come in contact with the carcass, shall be treated as provided in rule 11.

(b) Blackleg.—Carcasses of animals showing lesions of blackleg shall be condemned.

(c) Hemorrhagic septicemia.—Carcasses of animals affected with hemorrhagic septicemia shall be condemned.

(d) Pyemia and septicemia.—Carcasses showing lesions either of pyemia or septicemia shall be condemned.

(e) Rabies.—Carcasses of animals which showed symptoms of rabies before slaughter shall be condemned.

(f) Tetanus. Carcasses of animals which showed symptoms of tetanus before slaughter shall be condemned.

(g) Malignant epizootic catarrh.—Carcasses of animals affected with malignant epizootic catarrh and showing generalized inflamation of the mucous membranes shall be condemned.

(h) Hog cholera and swine plague.—Carcasses showing generalized or extensive lesions of hog cholera or swine plague, and carcasses affected with either of these diseases and showing febrile changes shall be condemned. All organs or parts showing lesions of either disease shall be condemned.

(i) Actinomycosis, or lumpy jaw.—Carcasses affected with actinomycosis, showing generalized or extensive localized lesions, or showing malnutrition in addition to the actinomycotic lesions shall be condemned. All organs or parts showing lesions of the disease shall be condemned.

(j) Caseous Lymphade tis.—Carcasses showing extensive lesions of this disease in the lungs with or without pleuritic adhesions, or caseous nodules in several of the visceral organs with emaciation, shall be condemned.

(k) Tuberculosis.—Carcasses, parts or organs affected with this disease, shall be disposed of as follows:

A. The entire carcass shall be condemned.

1. When lesions of tuberculosis exist in the musculature or in other structures that may readily be eaten with the flesh, and when it is not evident that the lesions are purely local and may be completely removed.

2. When there is evidence that tuberculosis bacilli have been carried by the blood.

3. When there are extensive and acutely progressive lesions, even though they be local.

4. When there is evidence of tuberculous intoxication or associated septic infections.

5. When it was observed before the animal was killed that it was suffering with fever.

6. When there is a tuberculous cachexia, as shown by anemia and emaciation.

B. An organ or a part of a carcass shall be condemned:

1. When it contains a lesion of tuberculosis.

2. What it contains, has been attacked by or has been contaminated with tubercule bacilli.

(l) Texas Fever.—Carcasses showing sufficient lesions to warrant the diagnosis of Texas fever shall be condemned.

(m), Parasitic Ictero-hematuria.—Carcasses of sheep affected with parasitic ictero-hematuria shall be condemned.

(n) Mange, or scab.—Carcasses of animals affected with mange, or scab, in advanced stages, shall be condemned.

(o) Tapeworm cysts.—Carcasses of animals extensively affected with tapeworm cysts shall be disposed of in accordance with the rules and regulations of the Bureau of Animal Industry, United States Department of Agriculture.

(p) Pneumonia, pleurisy, enteritis, peritonitis and metritis. Carcasses showing generalized inflammation of one of the following tissues: The lungs, pleura, intestines, peritoneum, or the uterus, whether in acute or chronic form, shall be condemned.

(q) Icterus.—Carcasses showing an intense yellow or greenish-yellow discoloration, after proper cooling, shall be condemned. Carcasses which exhibit a yellowish tint directly after slaughter, but lose this discoloration on chilling, may be passed for food.

(r) Uremia and sexual odor.—Carcasses which give off the odor of urine or a strong sexual odor shall be condemned.

(s) Urticaria, etc.—Hogs affected with urticaria (diamond skin disease), *tinea tonsurans*, *demodex folliculorum*, or erythema, may be passed after detaching and condemning the skin, if the carcass is otherwise fit for food.

(t) Infections that may cause meat poisoning.—All carcasses of animals so affected that consumption of the meat or meat food products thereof may give rise to meat poisoning shall be condemned. This covers all carcasses showing signs of septicemia or pyemia, whether puerperal, traumatic, or without any evident cause; hemorrhagic or gangrenous enteritis or gastritis; acute inflammation of the lungs, pleura, pericardium, peritoneum or meninges; acute, diffuse metritis, or mammitis; polyarthitis; phlebitis of the umbilical veins; traumatic pericarditis; and any inflammation, abscess or suppurating sore, if associated with acute nephritis, fatty and degenerated liver, marked pulmonary hyperemia, and diffuse redness of the skin, either singly or in combination.

Immediately after slaughter of any animal so diseased, the premises and implements used must be thoroughly disinfected as prescribed in rule 11.

The part of any carcass coming into contact with the carcass or any part of the carcass of any animal covered by this section, or with the place where such animal was slaughtered, or with the implements used in the slaughter, before thorough disinfection of such places and implements has been accomplished, or with any other contaminated object, shall be condemned; in case the contaminated part is not removed from the carcass within two hours after such contact, the whole carcass shall be condemned.

(u) Tumors.—Any organ or part of a carcass which is the seat of tumor, malignant or benign, shall be condemned.

(v) Melanosis, psuedoleukemia.—Carcasses of animals showing any disease such as generalized melanosis, pseudoleukemia, etc., which affects the system of the animal, shall be condemned.

(w) Flukes.—Any organ (lungs, liver, spleen, etc.), or part of a carcass, which is affected with flukes (Trematoda) shall be condemned.

(x) Emaciation and anemia.—Carcasses of animals too emaciated or anemic to produce wholesome meat and those carcasses which show a slimy degeneration of the fat or a serious infiltration of the muscles shall be condemned.

(y) Pregnancy and parturition.—Carcasses of animals in advanced stages of pregnancy (showing signs of preparation for parturition), also carcasses of animals which have within ten days given birth to young and in which there is no evidence of septic infection, may be rendered into lard, or tallow if desired by the manager of the establishment, otherwise they shall be condemned.

(z) Immaturity.—Carcasses of animals too immature to produce wholesome meat, all unborn and still-born animals, also carcasses of calves, pigs, kids, and lambs under three weeks of age shall be condemned.

(aa) Dead animals.—All animals that die in slaughter house pens, and those in a dying condition before slaughter, shall be condemned. Animals which have died shall not be allowed to pass through compartments in which food products are prepared. No dead animals shall be brought into an establishment for rendering from outside the premises of such establishment.

(ab) Bruised parts.—When a portion of a carcass is to be condemned on account of slight bruises, which cannot be properly removed until the carcass is chilled, the carcass shall be tagged and hung up apart from sound carcasses, preferably in a special retaining room. After chilling, the affected portion shall be cut out, marked "Condemned. Pa. Livestock Sanitary Board," and the remainder of the carcass shall be marked "Examined and Passed. Pa. Livestock Sanitary Board."

31. All processes used in curing, pickling, preparing, or canning meats and meat food products in establishments where complete inspection is maintained shall be supervised by a representative of the State Livestock Sanitary Board and no fixtures or appliances, such as tables, trucks, trays, vats, machines, implements, cans or containers of any kind, shall be used in such establishment, or in any other, unless they are clean and sanitary, and all steps in the process of manufacture shall be conducted carefully and with strict cleanliness.

HORSE BREEDING. The necessity for some action to improve the quality of the horses bred in Pennsylvania has been apparent for a long time. Other states have felt this same necessity, but as yet there has been no concensus of opinion as to the action that is most likely to be fruitful under our varying conditions. Somewhat tentatively, at the instance of the Pennsylvania Livestock Breeders' Association, an act was passed by the last Legislature to encourage the breeding of horses, to regulate the public service of stallions and to require the registration of stallions. The law is given in full above. It is pamphlet law No. 92.

The administration of this law has been placed in the hands of Professor Carl W. Gay, who is familiar with the horse breeding conditions in the eastern and central western states. Prof. Gay has made a study not only of horses but also of the measures that have been employed in other states and in other countries with the purpose of encouraging horse breeders and improving horse breeding conditions.

It means a great deal to the State that the horses shall be of good quality, and the horses on the farms and in the cities and towns are an important asset to the Commonwealth; if they are increased in efficiency and value but ten per cent. as ought to be possible under the influence of appropriate leadership and direction, this would mean at present prices, an increase of more than $8,000,000, in the value of the horse property of the State. One of the chief influences tending to keep down the horse breeding in Pennsylvania is the use of the inferior sires of mixed ancestry. Such horses are sometimes patronized through ignorance and sometimes because they are misrepresented by their owners. Under this law, the misrepresentation of the breeding of a horse is prevented. It may be said it is a measure against the "false labeling" of stallions. In addition, every effort is being used to encourage the owners of mares to improve the quality of their stock and to practice judicious and up-lifting mating. What follows is Professor Gay's statement as to the intent of the horse breeding law and his own suggestions in connection with its enforcement:

"The report of the United States Department of Agriculture for the year 1905 shows the total number of horses on the farms of Pennsylvania to be 656,106, having an average valuation of $102.57 or a total of $67,296,787. In the number of horses on farms, Pennsylvania stands twelfth among the other states of the Union, while a census of the horses in the cities of the State gives their number as which is greater than a similar census given for any other state. In a general way, the number of horses in the cities is an indication of the the number consumed, while those on the farms are representative of the source of supply. These figures, however, do not give even an approximate idea of the balance between production and consumption in Pennsylvania, since there is an active demand among the farmers themselves for market horses. This State does not, therefore, stand even twelfth in horse production, while it consumes as many, if not more horses than any other state. This fact alone is strongly suggestive of much greater possibilities for horse breeding as an industry than are realized at the present time. This has become a matter of comment at the great western markets, the strength of which is largely maintained by eastern buyers. In a recent issue of a leading livestock journal of the country, an editorial was devoted to this topic, the substance of which was that in view of the medium price of land and cost of grain in the East compared to the margin allowed by the buyer of horses purchased in the West to be sold in the East, horse breeding would appear "to be one of the most profitable lines of livestock husbandry which might be followed" by Pennsylvania farmers. The advantage of more economic production possessed by the western breeder is to a large extent offset by the low price for which he must sell to the shipper of the cost of marketing which must be deducted from his profits in case he sells direct to the consumer. The eastern farmer, on the other hand, has not the means of finishing his horses for market at so low a cost but his markets are more accessible and but a small allowance is necessary as the cost of placing them there.

"A review of the market reports from the great horse centers for the past few years, show the prices of choice horses of definite type to have been remarkably firm, the demand usually in excess of the supply, while, as a rule, the common unclassified stuff has sold at what would be a loss to the producer. The call continues to be for more but better horses and this demand has been met by a more systematic effort at improvement than heretofore marked the horse breeding industry in this country. The official part of the movement may be said to have been inaugurated by the United States Department of Agriculture, when in 1904 they secured special appropriations to be devoted to experimental work along this line. Subsequently the matter has been taken up by some of the states whose first step has been the most logical means of affecting improvement, namely the regulation of the stallion services which are offered to the breeding public. Laws are now in force in Wisconsin, Minnesota, Utah and Pennsylvania as well as in some of the Canadian provinces which have as their object the protection of the breeders from misrepresented, common bred, unsound sires whose influence would be a detriment to the stock of the country and a loss to the breeders. The law enacted by the last Pennsylvania Legislature is similar in its essential features to those of the states already referred to and is really an adaptation of the system that prevailed in France, with obviously good results, for over a century. It was proposed by some of the most prominent breeders of the Commonwealth, who recognized the need of some such measure, and its final enactment was the result of the united efforts of the breeders of the State through their organization, the Pennsylvania Livestock Breeders' Association. The president, Hon. W. C. Norton, of Waymart, was one of the most energetic advocates of the proposed bill. These breeders were controlled wholly by public spirited motives, seeking only to encourage and promote the horse breeding industry of the State.

"There seems to be no question that the intent of the law is commendable, although some criticisms are made of the means by which the end is attained. It should be borne in mind, however, that the first thing necessary was to draft an act which would pass the Legislature and become operative without incurring so much opposition as to kill it or make impossible its enforcement. Certain provisions which at first would be out of the question or at least unadvisable may ultimately be incorporated in the law.

"A mailing list has been compiled from the membership roll of the Pennsylvania Livestock Breeders' Association and from addresses derived from other sources. Circular letters were addressed to each person whose name was thus secured, enclosing a blank form with a request that there be reported thereon the names and addresses of all stallion owners in the State known to the person addressed, and to each person so reported were sent a circular letter advising him of the existence and requirements of the law, a copy of the law itself, a circular of information pertaining thereto and blank forms for application, for a veterinarian's certificate of soundness and for owner's affidavit.

"Following are some of the results which it is hoped the successful administration of this act will accomplish:

"1. The prevention of misrepresentation regarding the breeding or registration of any stallion standing for public service.

"2. The elimination, from the breeding ranks, of all horses, the get of which are especially liable to be rendered unfit for useful service on account of hereditary unsoundness or disease.

"3. The means of determining those individuals from which, on account of their superior breeding, type or conformation, may be expected most uniformly satisfactory results.

"4. The proper registration in an official stud-book of many individuals whose eligibility may be satisfactorily proven, although at the present time either nonregistered on account of lack of appreciation of such procedure on the part of the owner or, through ignorance, are recorded in an unauthorized stud-book.

"5. A general stimulation of interest in market horses and their production and a wider dissemination of reliable information concerning the horse breeding industry."

The circular that was prepared to introduce the horse breeding law to the breeders of the State is as follows:

"Pennsylvania is the second largest consumer of horses of any state in the Union. This fact is suggestive of great possibilities for the horse breeding industry in our State. When we note, however, that of the great number of horses which find a market here, only a small percentage are home bred, we are led to believe that these possibilities are not realized in full. It is true that in some districts a number of horses are being fed and finished for local and even foreign trade, but these are mostly of one type and they too for the most part are bred outside of the State. It is claimed that the horses produced in Pennsylvania to-day are fewer in number and inferior in type and conformation, to those of a decade or more ago. In fact, the most significant feature of the horse industry in Pennsylvania, as seen at the present time, is the excellent market it provides for the products of other states.

"Unless it can be demonstrated that there are good and sufficient reasons for the existence of such conditions, we must conclude that the farmers in Pennsylvania are not availing themselves of the opportunities that this state affords them.

"Three things essential to success in horse breeding are good blood, ample feed and such prevailing conditions as will insure economic production. The breeders in Pennsylvania can fulfill all these requirements. In regard to the first, they are perhaps the most deficient, but that condition is the one most easily rectified. A census of the horses in the State would undoubtedly show that, while there are many stallions of the highest class, the blood available to the breeder is inferior, in general, to that found in any other states. This is reason enough why it should be improved. Furthermore, good natural pastures, second in importance only to the blood with which they are stocked, constitute one of the greatest resources of the Pennsylvania breeder. The small grains are produced in abundance and corn is a leading crop in some sections so that altogether, in the great diversity of farm crops which can be grown in different parts of the State, means of meeting almost every requirement of the breeder and feeder may be found. With the best markets for all types close at hand, an abundance of reasonably cheap land well adapted to the growth of pasture and forage crops, together with certain especially favored counties producing all the grain that is required in fitting for market, we need only to improve the breeding stock in order that there may be bred, grown, finished and marketed, all within this State, horses which will sell with a good margin of profit.

"The market for high class horses has seldom been stronger or steadier than it is to-day, but buyers are discriminating and horses must classify according to certain type standards and be the best representatives of their respective classes in order to command the top prices. Such a demand is to be met only by an intelligent effort on the part of the breeder.

"No one of the great natural laws manifests itself with more regularity and certainty than the law that "Like begets like." Full knowledge of this fact must be had if one is to breed "market toppers," or even good, useful horses. Individuals which are unsound, off-type, or of mixed or inferior breeding will be just as sure to produce animals of little value and utility as they themselves are sure to be disqualified by the buyer of good horses. There are too many stallions of low class standing for public service in Pennsylvania; these unnecessarily waste and restrict rural wealth and prosperity and tend, in measurable degree, to check development of the resources of the Commonwealth. There is too much misrepresentation of stallions to owners of brood mares. It has thus become necessary to prevent such fraud, to designate stallions of greatest breeding value and to eliminate the wholly unfit."

At the instance of the State Livestock Breeders' Association, and following the precedent of European countries, notably France, and also some of the Canadian provinces, together with several of the United States, including Wisconsin, Minnesota and Utah, the legislature of 1907, passed a law (Act of April 25th, 1907, P. L. 92), the substance of which is as follows:

1. The name, description and pedigree of every stallion in the State used for breeding purposes shall be enrolled, by its owner, with the State Livestock Sanitary Board. A certificate of such enrollment must be filed with the prothonotary of the county or counties in which the stallion stands for public service.
2. In order to obtain such a license certificate the owner must file a veterinarian's certificate, or his own affidavit as to the freedom of his horse from hereditary unsoundness, etc.
3. Pedigrees of all pure bred stallions for which license certificates are asked, shall be submitted and owners who furnish registry certificates, properly authorized, shall be granted a license certifying the stallion to be pure bred. The license certificate of a stallion, whose sire or dam is not pure bred shall designate him as grade, while a stallion whose sire and dam are pure bred but of different breeds shall be licensed as cross bred.
4. Copies of the stallion's license certificate shall be kept posted in conspicuous places both within and upon the outside of the main door of the stable, where such stallion stands for service. Every bill, poster or advertisement shall contain a copy of the certificate of registration.
5. Unsound stallions, for which license has been refused, after they have been duly certified by the State Veterinarian, shall not be used for public service in this State.
6. A fee of $1 for examination and enrollment of each pedigree and an additional fee of $1 for the license certificate, to be renewed annually, shall be paid to the State Livestock Sanitary Board. The fees thus paid are to be deposited in the State Treasury for the use of the Commonwealth.
7. Transfers of certificates of enrollment will be issued upon the submittal of satisfactory proof of a transfer of ownership and upon the payment of a fee of fifty cents.
8. The State Livestock Sanitary Board is authorized to issue certificates of approval upon voluntary requests from the owners of stallions, showing that such horses, on account of superior type, conformation and breeding are especially commended to the breeders of the State.
9. Violations of the provisions of the act shall be punished by a fine.

The successful administration of the above act will insure to the breeders of this Commonwealth:

First, The prevention of misrepresentation regarding the breeding or registration of any stallion standing for public service.

Second, The elimination, from the breeding ranks, of all horses, the get of which are especially liable to be rendered unfit for useful service on account of hereditary unsoundness or disease.

Third, The means of determining those individuals from which, on account of their superior breeding, type or conformation, may be expected most uniformally satisfactory results.

This law represents the mature thought of many breeders who were controlled wholly by public spirited motives, and it will be administered to encourage and promote the horse breeding industry in this Commonwealth. With important elements of real danger removed and with the sources of the greatest benefits indicated, it is hoped that breeders will be helped to follow the course this act is intended to make clear.

Blanks for the use of stallion owners in applying for the registration of their horses and any additional information that may be required on this subject will be furnished upon application to Dr. Carl W. Gay, Department of Agriculture, Harrisburg, Pa.

LABORATORY. The work of the laboratory in Philadelphia has been carried out chiefly by Dr. E. S. Duebler and Dr. John Reichel. The work outside of the laboratory, as vaccination, has been done by Dr. Deubler, and the work within the laboratory proper has been conducted by Dr. Reichel, who has prepared the following statement of this division of the work of the State Livestock Sanitary Board for the past year:

"Compared with the year 1906 the work was accomplished in a better regulated and a more thorough manner, in that the routine was better developed. The specimens received for diagnosis outnumbered those of last year and, in addition, consisted of a greater variety as will be seen where these are classified.,

The following biological products were made and sent out from the laboratory:

Tuberculin. 22,655 c. c. of concentrated tuberculin have been made, requiring the inoculation of 1,979 flasks each containing 200 cubic centimeters of glycerine bouillon. No change in the preparation of the tuberculin was made, but various experiments were carried out, the results of which, however, did not alter the original method. The difference in growth of the tubercle bacillus was studied upon bouillon to which 1 per cent. of sodium phosphate was added in place of 1 per cent. sodium chloride. Dorset in his article upon the growth of the tubercle bacillus upon these two media stated that the growth was more vigorous upon the bouillon containing the sodium acid-phosphate. This was found to be true so far as exuberance of growth is concerned, but in weighing six week-old growths from each medium we found them to weigh practically the same. An attempt was made to determine the difference in the toxicity of the tuberculin made from a non-virulent human tubercle bacillus culture (W) and a virulent bovine tubercle bacillus culture (H). A separate lot of tuberculin was made from each culture, and tested upon healthy and tuberculous guinea pigs. No marked difference could be noted from the results obtained. Good reactions were obtained with each tuberculin upon tubeculous cattle. Tuberculin for the ophalmo-tuberculin test, has been prepared.

Tuberculosis vaccine. The preparation of this vaccine is now a matter of routine, the technique of which has been improved upon considerably during the past year.

Mallein. 1,840 c. c. of concentrated mallein have been made. The preparation of mallein still proves to be a tedious task. So few of the strains of cultures isolated prove of the proper virulence, or retain that virulence during the eight to nine weeks a culture should be permitted to grow.

Anthrax vaccine. 1,575 doses of vaccine No. 1 and No. 2 were sent out. The anthrax vaccine cultures were tested out early in the year upon white mice, guinea pigs and rabbits, and were properly standardized.

Specimens sent for diagnosis. During the year 365 speciments were received at the laboratory for diagnosis, of which 9 came in such badly decomposed condition as to make an examination impossible.

Rabies. 111 heads were received for the examination of rabies, including 90 dogs, of which 71 were positive, 15 negative and in 4 decomposition interferred with the examination; 4 horses, 1 positive, 3 negative; 15 cows, 10 positive, 5 negative.

The diagnosis was made by the use of three methods:

(1) Smears and sections of the various brain structures were examined for Negri bodies.

(2) Sections were examined for the presence of endothelial cell projections of the blood vessels and lymph-sacs around the ganglion cells.

(3) Animal inoculations.

The third method was used as a decisive test when the results of the first and second were doubtful.

From the work during the year 1906 upon rabies, the diagnostic value of the Negri bodies was proven beyond question, and as a result the following rules were found to be reliable to in making the diagnosis during the year:

(1) Negri bodies demonstrated, diagnosis positive.

(2) Suspicious bodies in fresh brains with marked ganglion proliferation changes, diagnosis positive.

(3) Negri bodies not demonstrated, and no ganglionic proliferation changes, diagnosis very probably negative. Animal inoculation made.

(4) Negri bodies not demonstrated and ganglionic proliferation changes present, diagnosis uncertain. Animal inoculation made.

The use of smears has proven the most rapid and efficient method in the demonstration of the Negri bodies. No special line of original work on rabies was attempted, the work being carried out in a form of regular routine, which, however, brought out some interesting facts in the diagnosis of this disease.

Tuberculosis. 27 specimens were received for examination consisting of parts of organs and growths from cattle. The existence of tuberculosis was demonstrated in 14; 13 were found to be non-tuberculous.

The diagnosis was made upon:

(1) Tubercle bacilli demonstrated in smears.

(2) Animal inoculations.

If, as frequently happened, the smears failed to reveal tubercle bacilli and the animals inoculated died before it was possible for lesions of tuberculosis to develop, the diagnosis was then made, if possible, from the microscopic examination of the specimens. Aside from the diagnosis of tuberculosis, the vaccination work was carried on and Experiment 115 (U) and 115 (O) upon cattle were completed. The rabbit experiment of Experiment 115 (O) was started but not completed within the year.

An experiment was carried out upon guinea pigs for the purpose of solving the following problem: to determine the ability of the tubercle bacilli to pass through the intestinal wall of healthy animals and the time required for them to reach the lungs.

Glanders. 132 specimens were received for examination; these may be divided into two classes:

(1) Blood from horses and mules suspected of glanders.

(2) Pus from abscesses or nasal discharge.

The discovery of epizootic lymphangitis in the State, has caused an increase in the number of specimens of pus.

Where the Saccharomyces was not found, glanders was suspected and a pair of male guinea pigs were inoculated. Of 32 specimens of pus, the presence of glanders was demonstrated in 10 and not demonstrated in 20. In the ten positive cases, the presence of glanders bacilli was demonstrated, in that guinea pigs inoculated developed a marked orchitis from which, in many instances, a culture was isolated, making the diagnosis unquestionable. It has been proven that the *Bacillus mallei* may be present but not be capable of infecting the pig and therefore, fail to cause a reaction. In such case another specimen of pus was usually asked for in addition to a specimen of blood for the glanders agglutination test. The glanders serum agglutination test was tried upon 100 specimens of blood drawn from horses and mules suspected of glanders, of which 56 tests were regarded as positive, 42 negative and 2 suspicious. As the glanders agglutination test is as yet in its infancy, many experiments, to determine its real diagnostic value, were carried out, as follows:

(1) To determine whether the thickness of the emulsion used in the glanders agglutination test had an influence on the final results.

(2) To determine the difference in the agglutination between live and dead *Bac. mallei.*

(3) To determine how long an emulsion kept at a low temperature would retain its power to agglutinate.

(4) To determine if the addition of stains to the emulsion would bring out the precipitated and agglutinated bacteria more distinctly.

(5) To determine the effect of heat on the agglutinating property of serum from the blood of a horse with glanders.

(6) To determine the effect of heat on the agglutinating property of the blood serum, from a horse with glanders, in heating the entire blood and then drawing off and diluting the serum.

(7) To determine the difference in the agglutination of serum from a horse with glanders, which had been kept at a low, even temperature and in an incucubator at 37 degrees c.

(8) To determine if the blood serum from horses free from glanders increases in its power to agglutinate *Bac. mallei* after the injection of mallein.

(9) To determine the relation of the degree of the agglutination to the temperature reaction of the mallein test.

All the experiments carried out have tended to impress the technique of the test, which is now being carried out with uniformity. The results have been perplexing at times and more experience is necessary to thoroughly establish the true diagnostic value of this method.

Epizootic lymphangitis. The discovery of the organism of epizootic lymphangitis, *Saccharomyces farciminosus*, in pus sent from the western part of the State from horses with a form of lymphangitis, resembling farcy confirmed the existence of epizootic lymphangitis in the State of Pennsylvania, which theretofore had not been demonstrated in America. In June, 6 specimens of pus were received from Punxsutawney, Pa., collected from horses suffering from a disease later diagnosed to be epizootic lymphangitis. The pus was microscopically examined, the organism *Saccharomyces farciminosus* was thought to be present. The pus was cultured and in a month the organism was isolated, confirming the rather uncertain diagnosis made from the miscroscopic examination of the pus. Infection was sucessfully accomplished in a horse inoculated with the culture isolated. During the latter part of the year, twenty-three specimens of pus were received, taken from horses with suspected epizootic lymphangitis. Seven were received before the organism had been isolated proving the existence of the disease in the State. After the organism was isolated it was seen in nine specimens of pus received. Of the nine, the organism was successfully isolated from three. Aside from isolating the organism, *Saccharomyces farciminosus*, its pathogenisis upon guinea pigs and rabbits was tried, and its cultural characteristics were studied to some extent.

Anthrax. During the year 11 specimens, chiefly sections of the internal organs, rarely an ear, was received for examination; 10 from cattle, 1 from a mule. Of the 11, the anthrax bacillus was demonstrated in three and not demonstrated in eight. The following method has been followed in the diagnosis of anthrax:

(1) Smears are made from the blood and tissues, type of organism noted.

(2) Cultures are made, examined in twenty-four hours and characteristics of growth carefully studied.

(3) Smears of growth stained and examined. This is usually sufficient but should any doubt remain as to the diagnosis, the motility of the organism isolated is studied (anthrax being non-motile) and animal inoculations are resorted to.

Hog cholera. Three specimens from animals suspected of hog cholera, consisting of sections of the organs were examined. In two a positive diagnosis was made, the other was regarded as negative.

Swine plague. Specimens of the internal organs of one hog were received. A short non-motile polar staining bacillus was isolated, as found in swine plague.

Miscellaneous specimens. During the year specimens were received, for microscopic examination, including the following tumors: Fibroma, squamous epithelioma, melanotic sarcoma, carcinoma, endothelioma. Among the miscellaneous specimens were a number in which decomposition prevented an examination. Tissues were submitted from animals dead of forage poisoning (cerebrospinal meningitis), lung worm (sheep), parasites and osteoporosis.

Fowls. Sixteen chickens were received, 8 living and 8 dead, with the request that the cause of death or illness be determined. Of the 8 live chickens, two were killed at the laboratory and at autopsy no abnormality was found. The remaining six recovered and were returned to the owners.

Pigeons. Nine pigeons were sent by H. J. Newburger, Freeland, Pa.; four living and five dead. The cause of death was not determined, one of the four live birds was killed at the laboratory, the remaining three were kept under observation for months, showed no symptoms and were returned to the owner.

Poisoning. Six specimens were received with the request that a chemical analysis be made. These were usually held until further advice was received in answer to a communication to the effect that a chemical analysis was not made in our laboratory.

Pathological histology. The work of fixing, mounting, cutting and staining of the sections, taken from the specimens received and experimental animals used in the diagnosis of rabies and tuberculosis and those used in the experiments upon tuberculosis, has increased to twice that of the previous years. Aside from the large number of cases of rabies examined, sections were taken from one hundred and twenty-three animals, including portions of 92 lymph glands, 68 lungs, 56 livers, 39 tumors, 14 medulla oblongatae, 17 cerebelli, 17 hippocampi major, 5 muscles, 6 intestines and 45 miscellaneous sections."

BACTERIAL DYSENTERY OF CATTLE. On a small farm in Eastern Pennsylvania a disease of cattle has been known to occur for several years with the following characteristics: An occasional mature cow, and usually a young one, will develop diarrhea from no visible cause and while subsisting on the same food as that upon which the other cattle of the farm are thriving. The diarrhea develops progressively. At first there is noticeable increased softness of the faeces. In the course of a few weeks the faeces become quite soft and are voided frequently. For a long time the appetite continues to be good but, notwithstanding, the cow declines gradually in condition; there is loss of flesh, harsh coat and inelastic skin. Gradually, the appetite diminishes, and after a few weeks or months the cow will eat very little. A change of food sometimes appears to give temporary relief, and this is especially noticeable when an affected cow is placed on pasture in the spring; the animal may improve for a time and may even appear to have recovered, but later in the season or the next winter the diarrhea will return and the cow will die. Medicines given internally as stringents, laxatives, tonics and antiseptics produce, at most, only a little, temporary relief. The disease progresses steadily and the animal becomes thinner; there is marked muscular weakness, and, finally, the cow dies while in a state of extreme emaciation and exhaustion.

The course of the disease, including the periods of partial recovery, may be as long as two or three years, or as short as two months.

In the case of the herd referred to, it was suspected that the cattle were tuberculous. The tuberculin test was applied and not one cow reacted. At different times a few of the advanced cases were killed. No lesions were found that furnished a satisfactory explanation for the marked disturbance during the life of the animal. The most that was detected was what appeared to be the effects of chronic intestinal catarrh.

After the publication of Bang's paper on "The Chronic Pseudotuberculous Enteritis of Cattle," in October, 1906, it occurred to me that the baffling disease that we have studied so unsatisfactorily might be the same as that described by Bang. This view was strengthened by McFadyean's discussion of this disease in his Journal in March, 1907.

It was not, however, until December that it was possible to obtain a suitable case for study. The cow was sent to the Veterinary Hospital of the University of Pennsylvania. It was extremely emaciated. The mucous membranes were pale; the temperature was normal; the appetite was very poor; the faeces were voided frequently, in small quantities, and they were of dark brown color, of the consistency of molasses. The cow died during the second week of her stay at the hospital. The postmortem examination revealed some thickening and an unusual amount of corrugation of the mucous membrane of the large intestine, including the rectum. Some small red points, streaks and patches were seen, especially at the summits of the ridges of the mucous membrane. Dr. Reichel was requested to stain scrapings of the intestinal mucous membrane as for tubercle bacilli. He found quantities of acid-fast bacteria in clumps and isolated.

Another similar case was reported by Dr. W. H. Ridge, Trevose, Pa. The cow was a pure bred Jersey, 5 years old, raised on the farm. She was thin and weak and had had diarrhea for nearly a year. She was killed for postmortem examination. Briefly, the necropsy showed slightly increased color of the outer surface of the colon and of the posterior portion of the small intestine. The mucous membrane of the large intestine and especially of the caecum and of the anterior portion of the colon was thickened slightly, was rather firm, less elastic than normal, and was thrown into unusually well defined folds and ridges. Upon the ridges there were scattered red spots, usually quite small and sometimes made up of distinct fine lines. These small areas of red color were few in number and widely scattered. The small intestine was similarly affected, but to less extent. Only the posterior two-thirds of the small intestine appeared to be involved. The mesenteric lymphatic glands were slightly enlarged, and the cut surfaces were moist. The liver was more than normally red in color and was abnormally firm. Specimens were taken to the laboratory for examination. Scrapings were stained from the mucous membrane of the large intestine, from the mesenteric glands and from the liver. In all of these locations were found acid-fast bacteria, a little shorter and, relatively, a little thicker than the bovine tubercle bacilli. These organisms were especially numerous in the mucous membrane of the large intestine. Additional bacteriological and pathological studies are to be made.

There appears to be no doubt that the disease here described is the same as the disease found by Johne and Frothingham in a cow at Dresden in 1895. It was their opinion that the cow might have been infected with avian or with attenuated mammalian tubercle bacilli. Acid-fast organisms resembling tubercle bacilli were found diffusely infiltrated in the mucous membrane of the large intestine. Only a few of the scattered cases were reported until Bang made his researches which were published in 1906. On account of the resemblance of the causative organism to the bacillus of tuberculosis, he called the disease a pseudo-tuberculosis.

In the American Veterinary Review, Professor Liautard gives a summary of some of the recent observations in regard to this disease under the title of "Chronic Hypertrophic Enteritis." McFadyean suggests the name of "Johne's Disease." None of these names appears to be free from serious objection, and I suggest, tentatively, that the name chronic bacterial dysentery of cattle be applied.

There can be no doubt that the disease is infectious, and some experimenters have succeeded in transmitting it by feeding faeces and hacked fragments of diseased intestines.

Upon looking back, I can recall a number of herds that I now believe to have been affected with this disease. Some of the herds were large and the losses were great. After tuberculosis, as the cause of the bad condition of the cattle, had been excluded by the tuberculin test, the difficulty was thought to have been due to faulty dietetics or bad sanitation. But the disease occurs persistently in some herds, under such conditions that these hypotheses cannot be maintained. After discussing this matter with Dr. Ridge, Dr. Marshall, Dr. Conard and others, there appears to be little room for doubt that this disease is a rather widespread infection and that cases of it has not heretofore been recognized because the lesions are so slight. It is transmitted so slowly that its contagious nature has been difficult to determine. The latter fact, however, is not so remarkable when we consider that tuberculosis prevailed for centuries before it was known to be a contagious disease. Some of the so-called cases of chronic hemorrhagis septicaemia of cattle may be found to be cases of bacterial dysentery.

The lesions that occur in chronic bacterial dysentery of cattle are not in proportion to the severity of the symptoms. Since the loss of conditions commences in an early stage, and while the animal is still eating well, it seems to be probable that in addition to the disturbance of assimilation, there is an intoxication that produces emaciation. I have seen calves emaciate similarly when inoculated intravenously with cultures of avian tubercle bacilli that were incapable of producing tubercles.

EPIZOOTIC LYMPHANGITIS. A contagious disease of horses, not heretofore discovered in America, known as "Epizootic lymphangitis," has recently occurred in a limited district in Western Pennsylvania.

The chief seats of the disease are Armstrong, Butler, Clarion, Jefferson, Mercer and Venango counties. The disease has also occurred in a few other counties in the northwestern part of the State. Three affected horses have been found in Bradford county and one in Lancaster county. Indefinite reports of the occurrence of epizootic lymphangitis in Allegheny and Beaver counties have been received, but although a search has been instituted, it has not yet been possible to find horses affected with this disease in either of the two counties named. More than 100 affected horses have been found.

This disease has long been known in Southern Europe, Finland, Africa, India, China, Japan and the Philippine Islands. In 1904, it was carried into England from South Africa. How or when it reached Pennsylvania is not now known. As this is the first recorded outbreak of epizootic lymphangitis in America, it is a matter of much importance. The following brief account of the disease and of its treatment and prevention is furnished for the purpose of assisting in the control of the outbreak and in the eradication of the infection:

Epizootic lymphangitis is caused by a special yeast like fungus *(Saccharomyces farciminosus)* that is capable of growing in the tissues of the horse and mule. This parasitic plant occurs as minute cells, of characteristic form, in the pus that is disharged from the abscesses and the ulcers that it produces. Such infectious pus, or the disease producing organism that it contains, when brought in contact with an abrasion of the skin of a healthy horse may enter the abrasion and cause a local focus of disease. The infectious material may be transported by contact between the diseased and healthy horses, by stall bedding, by stable utensils, by harness, and in a variety of other ways—quite possibly by flies.

The important points are that the disease never occurs excepting as it is caused by this particular parasitic plant, and this plant is distributed only by horses or mules affected with this disease or by material contaminated with the discharges from such animals.

After entering a wound, or an abrasion of the skin, the organism grows, at first very slowly, and causes a local inflammation followed by the formation, in from three weeks to three or more months, of a nodule (a small, rather spherical, dense, tumor-like mass) beneath the skin and by the hardening and thickening of the regional lymphatic ducts and glands. The nodule gradually softens and forms an abscess, which discharges pus, leaving an indolent ulcer. Such processes occur most frequently upon one or both hind legs, but may occur in any part of the body and are not infrequently seen on a front leg, or on the shoulder or the side of the neck. The infection is carried by the lymphatic channels or it is spread over the surface and enters some abrasion on another part of the body. In these ways, the disease may spread in the individual subject.

A few horses appear to recover spontaneously, some may be cured by appropriate treatment, if treatment is started during the early stages, before much tissue is involved and while the lesions are superficial and may be got at; many subjects are not curable and continue to discharge and scatter infectious material, a menace to other horses, as long as they live.

The disease is said to be fatal in from 10 to 15 per cent. of all cases. Many cases that do not terminate fatally are very prolonged, extending over years, and these may result in the thickening of the legs to such an extent as to incapacitate and ruin a horse, though he may not be killed by the disease.

The importance of epizootic lymphangitis must be considered from the standpoint of the individual horse owner and from that of the public.

To the owner of a single infected horse, the matter may, or may not, be of serious pecuniary importance. If the case is a light one and if it follows the usual slow course, the infected horse may render service of but little less than normal value for months; in some cases for years. On the other hand, the disease may follow a more rapid course and cause numerous nodules, abscesses and ulcers on various parts of the body and a thick leg or two, and destroy from 25 per cent. to 75 per cent. of the market value of the horse, even if it is not rendered entirely unserviceable.

To horse owners at large—to the public—this disease is important, because, if it is not controlled, it will make another addition to the list of destructive diseases that are continuing sources of loss, and that must be guarded against.

The most common manifestation consists in the presence of small, chronic, discharging ulcers in the vicinity of the hook joint of a thickened hind leg. In such a case, one may also find small scars showing where ulcers have healed and there will probably be some firm nodules beneath the skin and, perhaps, one or more nodules that have softened, forming fluctuating abscesses. The regional lymphatic ducts are corded and the glands inside the thigh are hardened and nodulated.

The earliest observed symptom may be the occurrence of a firm nodule, from the size of a pea to that of a walnut, beneath the skin, anywhere on the body. Corded lymphatics extend from this lesion. In time, the nodule will soften and, at length, its purulent contents will break through the skin. The time required for these developments is most variable and may reach several weeks. Such pus is thick yellowish or greyish yellow and often it is mixed with blood. Sometimes it contains flakes.

In other cases, the first symptom observed is an indolent sore, covered with pus and scab, surrounded by a slightly swollen zone and from which one or more firm cords extend beneath the skin toward the lymphatic glands. This condition is, no doubt, the first to develop, but such a sore often escapes special notice until nodules occur.

Fresh ulcers may be surrounded by a slightly raised zone of bright red granulation tissue ("proud flesh"). The ulcers occur irregularly and they disappear slowly; some heal in a fortnight, others continue to discharge for months and, after healing, may break out again. From this long continued irritation and from the formation of scar tissue, the skin thickens and the affected parts become indurated.

Ulceration sometimes occurs upon the conjunctiva and on the mucous membrane of the nostrils and upper respiratory tract.

The affected horses do not, as a rule, show any constitutional disturbance excepting in very advanced cases.

This disease is often mistaken, in all countries in which it has occurred, for glanders and, especially, that glanderous condition known as farcy. The two diseases may be differentiated by the use of the mallein test, by guinea pig inoculation, by the agglutination test for glanders, and by careful regard to the symptoms peculiar to each disease. In epizootic lymphangitis, the pus discharged from the abscesses is thicker and more viscous than the usually rather oily pus from the ulcers of farcy; the ulcers in epizootic lymphangitis are flatter and show more granulations than is observed with relation to the crater-like ulcers of glanders; the nodulated lymphatic glands are often less firmly attached to surrounding tissues and, therefore, are more freely moveable in epizootic lymphangitis than in glanders.

The presence of the special parasite of epizootic lymphangitis in the pus is the most characteristic and important feature of the disease. This can be determined by microscopic examination.

If possible, all of the diseased tissue should be cut out or burned out and the resulting wound be treated by the use of strong antiseptics. This can be done only in early cases where the lesions are local and superficial. Otherwise, the abscesses and indurated lymphatics may be opened and treated antiseptically. A solution of bichloride of mercury, 1-250, or stronger, is especially recommended for this purpose. Lugol's solution may be used locally to treat the discharging wounds and the tincture of iodine may be painted over indurated lymphatics. Iodide of potash in large doses, given internally, is very beneficial in many cases. Horses extensively affected should be destroyed.

All cases of epizootic lymphangitis must be reported to the State Livestock Sanitary Board and they must be held in quarantine, as required by law.

Epizootic lymphangitis has been adjudged and proclaimed by the State Livestock Sanitary Board to be a disease of dangerously infectious or virulent character, and it has been listed with the disease enumerated in section 1 of the act of March 30th, 1905, (P. L. No. 56.)

Under the provisions of the aforementioned act of Assembly, it is unlawful to move any horse or mule afflicted with epizootic lymphangitis upon or across any public highway or to expose such animal to contact with other animals of the same species, or in any public place, except upon scientific permission so to do from a member or agent of the State Livestock Sanitary Board. Moreover, no person who has knowledge of such a diseased animal may lawfully conceal it or attempt to conceal it, or knowledge thereof, from a member or agent of the State Livestock Sanitary Board.

Practitioners of veterinary medicine are required by law to report all cases of epizootic lymphangitis of which they have knowledge to the Secretary of the State Livestock Sanitary Board.

The quarantine of horses and mules afflicted with epizootic lymphangitis means that they shall be kept apart from other animals of these species, and under such conditions that disease may not be spread by or from them. The premises such animals have occupied, and everything that they may have contaminated, must be disinfected, preferably, by the use of formalin.

The quarantined animals should be treated, if there is reasonable prospect that they may be entirely and permanently cured. If the cases are such that it is improbable that they can be entirely and permanently cured, they should be appraised and destroyed. Otherwise, they must remain in quarantine indefinitely.

The co-operation of all veterinarians and all horse owners is sought by the State Livestock Sanitary Board in their efforts to eradicate this new disease. It is hoped that it may be completely exterminated. If epizootic lymphangitis becomes permanently established here it will, in the end, cause enormous losses to horse owners, as is shown by the experience of the countries in which it now exists.

Every case should be immediately isolated and promptly reported. It will be much better to err on the side of safety and report suspected animals that may not have epizootic lymphangitis than to permit actual cases to go unquarantined. Every reported case will be investigated and if the report is not well founded the horse will be released, free from suspicion:

ANTHRAX. Anthrax has occurred during the past year in the following named counties: Berks, Bradford, Bucks, Cameron, Chester, Erie, Franklin, Jefferson, Lackawanna, Lycoming, McKean, Potter, Susquehanna and Tioga. One hundred and thirty-six cattle and four horses are known to have died of anthrax. This does not necessarily imply that other animals may not have died of this disease as, unfortunately, reports of deaths of animals from infectious diseases are not always made, although such reports are being sought for and are coming in better from year to year.

The practice of the State Livestock Sanitary Board is to establish a diagnosis of anthrax by laboratory examination whenever suitable material can be obtained. In several instances people have become infected with anthrax through contact with diseased animals or from the carcasses of animals dead of anthrax. Unnecessary handling of such carcasses is in all cases prohibited. Not only is it dangerous to remove the skin, but, if removed, it could not safely be used in commerce, and the skins are, therefore, in all cases, disposed of in the same manner as the carcass. The method of collecting material for the laboratory diagnosis of anthrax that was first proposed by McFadyean, is still in use to a considerable extent in our work. It consists in cutting off an ear, which may be placed in a clean glass fruit jar that may be hermetically closed. This jar is then packed in straw and ice, in a bucket, and sent to the laboratory. The blood vessels in the ear contain sufficient blood for laboratory examination. Advantages of this method are that it is easy to carry out, that it is relatively safe and that it is not necessary to open the carcass in order to obtain a specimen. Some of our correspondents have the impression that it is necessary to send a sample of spleen or of liver for laboratory examination when this disease is suspected. Such material is not generally necessary and a sample of spleen should not be taken under ordinary circumstances—only when the carcass is in such a location, as on top of a pile of wood where it is to be burned, or along side of a deep pit that has already been prepared, so that whatever leakage of blood there may be from the carcass may be burned with it or shoveled into the pit and deeply covered so that there can be no escape of infectious material. After the occurrence of a case of anthrax, where the diagnosis has been made in the laboratory, or when there are reasonable grounds for believing that the disease has occurred, the first action taken is to see that the carcasses of dead animals are properly disposed of by methods repeatedly described in previous reports, and then measures are taken to protect the exposed animals by vaccination. Seven hundred and forty-six animals have been vaccinated against anthrax during the past year. The double vaccination method that has been used has proven to be thoroughly effective. We have learned of no animal, during the past year, that has died of anthrax after the completion of vaccination.

ABORTION. Abortion has prevailed to a less extent in breeding herds than for many years. Now that this disease is recognized as a contagious disease and is treated as such, there is no serious difficulty in overcoming it. It is known that abortion may be conveyed from cow to cow in a herd by the bull. It may also be conveyed by contact between infected and uninfected cows. Disinfection and isolation are, therefore, indicated in the treatment and prevention of this disease. The infected animals, and animals that may reasonably be suspected of harboring infection, should be isolated from healthy animals until they have been thoroughly treated in such a way as to destroy the infection of abortion that they may carry. Full directions for this treatment have been published in earlier reports and in a circular from the Department of Agriculture, which may be obtained upon application.

A great deal of money has been spent by some herd owners for certain widely heralded secret "abortion cures." These "cures" usualy consist of two parts, sometimes of three. There is an injection that is used to disinfect the genital passages of the cow, and there is a "medicine" to be given internally, sometimes by the mouth, sometimes by subcutaneous injection. Then there is a disinfectant for the premises. So far as the injection operates as a disinfectant, it is useful; so far as the disinfectant for the premises is an effective reliable agent for this purpose, it is useful. It is more than highly probable that the good that comes from the use of these secret and high priced "cures" result from the action of cheap disinfectants that they may contain. The only internal remedy that, upon careful trial has seemed to be of any special service in abortion is carbolic acid. This is sometimes given by the mouth, sometimes it is injected in the skin, but it has been noted that this remedy cannot be relied upon excepting when it is accompanied by measures of disinfection as applied to the members of the herd and the premises that they occupy. Many herds excessively heavily infested with abortion have been entirely freed from this infection and placed upon a healthy basis by the use of disinfectants alone—disinfection of the infected portions of the diseased or exposed animals, and disinfection of the premises—without the use of any internal medicination.

As in the case with several infectious diseases, abortion sometimes runs its course and disappears without any treatment. Hog cholera sometimes does the same. Where this is true of a disease it is very easy, though faulty observation, to fall into the error of assuming that some particular process of treatment that has been used, is responsible for a cure which has been perfected wholly by nature, and which would have occurred just the same if no treatment or "cure" had been applied. It is this fact, no doubt, that has led to the undeserving endorsement of so many patent medicines. The value of a remedial method cannot be determined by one or by a few trials or by scattering observations without opportunity for correct comparison, made by men who are unfamiliar with the precautions that it is necessary to observe in order to draw sound conclusions in work of this kind.

This statement in regard to the use of proprietary remedies in the treatment of herds infected with abortion, is made for the purpose of protecting herd owners against disappointment and loss that may come from dependence upon the unfounded claims of the purveyors of these cures, and against the exorbitant prices which are charged for so much of these treatments as are of any value.

Actinomycosis, lumpy jaw or big jaw occurs occasionally among cattle in all parts of the State. This disease is not directly conveyed from animal to animal. Infection is derived from vegetation carrying the fungus actinomycosis upon which the animal feeds.

This disease is not of special importance in connection with the veterinary sanitary service of the State; it is of very limited prevalence and is mentioned here because inquiries are frequently made as to whether animals affected with this disease are required to be killed, whether such animals are appraised and paid for by the State and whether the flesh of such animals may be used for food. It is not required by law or by regulations of the State Livestock Sanitary Board that animals with actinomycosis shall be killed, or even that they shall be quarantined. Such animals are not paid for, appraised or condemned by the State. The only restriction in relation to such animals is as to their use as food producers. A milch cow with actinomycosis is undesirable both as a producer of milk and as a member of a milking herd. Even though the lump on the jaw may be small, if it is discharging there is the possibility that the organisms of suppuration as well as the fungus that produces this disease may, by some indirect means, contaminate the milk. In the case of animals with lumpy jaw that are slaughtered for food, it is required that the head shall be condemned. If lesions of actinomycosis are found in other parts of the body, the guiding principle in relation to the adjudication of the carcass are essentially the same as in the case of tuberculosis.

BLACKLEG. Blackleg has occurred during the past year in the following named counties: Bradford, Cambria, Clarion, Erie, Forest, Somerset, Susquehanna, Warren, Wayne and York. There were 42 reported deaths from blackquarter before vaccination was applied. Nine hundred and fifty-one animals were vaccinated on 74 farms. There were no reported deaths from blackleg after vaccination was completed.

GLANDERS. The following table shows the counties in which glanders has been discovered during the past year, the number of horses that were regarded as suspicious or that were exposed and tested, the number of horses or mules destroyed on account of the existence of glanders:

County.	Horses exposed or exposed and tested.	Destroyed.
Allegheny,	98	15
Beaver,	1	....
Bedford,	1	....
Berks,	14	5
Blair,	8	2
Bucks,	6	5
Carbon,	1	....
Cambria,	31	2
Centre,	2	....
Chester,	2	....
Clarion,	1	1
Clearfield,	1	....
Crawford,	2	....
Cumberland,	4	....
Dauphin,	4	3
Delaware,	7	1
Fayette,	2	1
Franklin,	9	2
Fulton,	8	1
Indiana,	....	1
Lackawanna,	23	....
Lancaster,	8	7
Lawrence,	1	....
Lehigh,	14	12
Luzerne,	15	3
Lycoming,	1	....
McKean,	1	1
Mercer,	2	2
Montgomery,	37	6
Northampton,	....	1
Perry,	1	....
Philadelphia,	1,161	136
Potter,	1	....
Schuylkill,	3	3
Susquehanna,	3	....
Tioga,	2	....
Union,	1	....
York,	52	8
	1,618	218

The total of the first column is 1618, against 1699 last year, and the total number condemned is 218 as against 283 last year.

The glanders situation of Philadelphia has improved somewhat, but there is still more glanders in Philadelphia than in all of the other sixty-six counties combined. A very energetic effort is being made to control this disease in all parts of the State and especially in Philadelphia, its chief seat. A careful watch is being kept on all sale-stables, and horse markets in general, and wherever a horse with glanders is located or where there is reason to suspect that there may be a horse afflicted with this disease, an immediate inspection is made and a quarantine is established, if necessary, until the suspected animal has been examined to determine whether it is or is not afflicted with glanders. For this purpose the mallein test is relied on to a very great extent. If there is a discharge of pus from a skin lesion, or from the nose, a sample of pus is taken for examination in the laboratory. This examination consists in guinea pig inoculation.

The collection of samples of blood for use in the agglutination test is sometimes practiced. Results of this method of examination are referred to in the report of the laboratory.

There has been great improvement during the year in the matter of reporting cases of glanders by owners and by veterinarians. Too much stress cannot be laid on the importance of early reports in this as in all other dangerous infections of animals. Sometimes, an outbreak is not discovered until it has continued for so long as to have led, unnecessarily, to the infection of several horses that might easily have been saved if the first appearance of the disease had been reported. Instances of this kind are becoming rarer as a result of the constant reminders that have been issued from this office.

The unusual prevalence of glanders during the last two years has made it necessary for the State Livestock Sanitary Board to incur more expense in the control of this disease than has heretofore been necessary. This has exhausted resources that might otherwise have been used in other directions, as in the control of tuberculosis. There has, however, been no question as to the importance or necessity of energetically opposing this disease. All experience shows that if glanders is not effectively controlled, its tendency is to continue to spread, to the enormous detriment of horse interests. The situation is one that can be controlled now at relatively moderate cost. If the resources of the State Livestock Sanitary Board were used in other directions, to the comparative neglect of this condition, the spread of glanders would undoubtedly be such as to render it necessary, in years to come, to expend sums of money to control glanders, so great as to be out of all proportion to the amounts now required. While it is unfortunate that some of the other work has to be restricted in order to effectively meet this new condition (and also the condition arising from the occurrence of epizootic lymphangitis) there is, in my mind, no doubt as to the propriety of the course that has been followed.

The plan for handling this disease is, in general, the same as has heretofore been described.

HEMORRHAGIS SEPTICAEMIA. This disease has occurred during the past year in the following named counties: Carbon, Centre, Jefferson, Mercer, Potter and Warren. Forty-five cattle have been reported as having died incident to the small outbreaks of hemorrhagic septicaemia that have occurred in these six counties.

HOG CHOLERA. This disease has been reported during the past year in the following named counties: Armstrong, Allegheny, Berks, Blair, Bucks, Carbon, Centre, Chester, Clearfield, Cumberland, Franklin, Huntingdon, Juniata, Lancaster, Lebanon, Lehigh, Luzerne, Lycoming, Mercer, Montgomery, Northumberland, Sullivan, Washington and Westmoreland. Most of these outbreaks have been small and have involved but one or a few herds in closely limited districts. In only few cases has the disease spread to more than six or seven farms. In most instances it has been possible to trace the origin of infection to hogs that have been shipped from a distance by railroad. In other cases, it has not been possible to determine the origin of the infection. The quarantine measures that have been adopted, the isolation of the affected hogs, the disinfection of the infected premises, have in most cases, sufficed to keep the outbreaks within bounds. But while it has been possible to keep outbreaks from spreading to many farms, the losses in some cases have been very heavy on the farms involved. There is great need in the control of this disease for a means of immunizing animals on infected or exposed farms. This problem is one that the Bureau of Animal Industry has been working on for a number of years, as noted in previous reports, and it is believed that this work is now developed to such a point that its results will soon be available for the protection and benefit of hog raisers of the country through its application by State veterinary sanitary services.

MANGE OF HORSES. This disease has occurred during the past year in the following named counties: Allegheny, Berks, Bradford, Bucks, Butler, Centre, Chester, Delaware, Juniata, Lackawanna, Lebanon, Lycoming, Montgomery, Monroe, Philadelphia, Somerset, Susquehanna, Tioga, Wayne and York. Not many cases have occurred in any one county. The greatest prevalence has been in Philadelphia and in Lackawanna counties. This disease has been traced to horses brought from the West, just as glanders has been so widely distributed in this State during the past two years in the same way. The fact that the disease has occurred in a large number of widely scattered places and that there have been very few cases in each outbreak, sometimes only two or three, tends to show that the infection is being distributed from some distant point of origin. Where an infectious disease has long been in a district there is evidence of its spread locally, and such evidence is rare in respect to mange of horses. In addition to this evidence, a considerable number of horses that have recently been shipped from the West have been found to be suffering from mange, usually in its early stages.

Mange spreads rather insidiously and the condition is not one to cause alarm to owners of infected horses until after it has progressed considerably. This being the case, it is probable that mange is more widely spread than appears from the cases that have been reported. If so, this will be emphasized by a decided increase in the number of reported cases next year.

The lime and sulphur wash, made according to the instructions furnished in the report of 1906, is a thoroughly effective and satisfactory remedy for the treatment of horses affected with this disease. All cases of mange, according to law, must be reported to the Secretary of the State Livestock Sanitary Board. Unfortunately, however, veterinarians are not called in, in many cases, to treat horses with mange until the disease is quite advanced and has spread to a number of horses in contact.

TUBERCULOSIS. During the past year, 1,819 animals afflicted with tuberculosis have been destroyed. These have come from 878 separate sources in sixty counties. The greatest number of tuberculous cows have come from the counties in which the dairy industry is most highly developed. There is, however, no county in the State that has not been reached by tuberculosis of cattle, although there are great differences in the extent of prevalence.

Most of the work that has been done by the State Livestock Sanitary Board in the repression of tuberculosis of cattle has been done in response to voluntary requests from the owners of tuberculous cattle or of suspected herds. There is no provision for a general systematic inspection of the cattle of any part of the State. To conduct a systematic, periodical inspection of herds, or, if not of all herds, then of dairy herds, would require a staff of assistants and an appropriation greatly in excess of those now provided.

There is in some quarters an urgent demand for the regular inspection of herds producing milk for use as market milk. This demand comes not only from milk consumers and from boards of health, but also from dairymen who are now doing good work, but who have to sell their product in the market in competition with milk produced on farms where no attention is paid to sanitation. Most of the consumers of milk do not discriminate between clean milk and dirty milk; they take it as it comes and pay the standard market price and ask no questions as to its source or as to the conditions under which it has been handled. If the milk contains a reasonable percentage of cream, if large quantities of visible dirt do not gather in the bottom of the container and if the milk does not sour within less than one day, the average consumer is satisfied. This lack of discrimination on the part of consumers is discouraging to those dairymen who take an interest in endeavoring to raise the standard of their products, who keep their herds free from tuberculosis, their premises clean and sanitary and who enforce the practices indicated by their knowledge of milk hygiene. For such producers to gain no market advantage over the man who has an infected herd and doesn't care, whose premises are dirty, whose utensils are unclean, whose facilities for washing and sterlizing are primitive or non-existent and who supplies milk of low hygienic quality, appears to be unfair to the careful producer. For the encouragement of good producers, it is important that bad unsanitary dairies should be improved or suppressed. This subject is mentioned in connection with the discussion of tuberculosis, not because tuberculosis is the only, or, perhaps, the most important part of the subject of milk hygiene, but because the public is rather in the habit of thinking that the eradication of tuberculosis is the first step that should be taken in efforts to improve the quality and wholesomeness of the milk supply. The fact is, that the eradication of tuberculosis from herds is but one of several things that it is necessary to do to place a milk supply on a proper basis. There are other diseases of cattle that are of importance; the sanitary condition of the premises, the purity of the water supply, the equipment of the dairy and its administration all have to be considered in this connection. It is, however, true, in most cases, that where a herd is free from tuberculosis the other conditions on the dairy farm are good. This is because the dairyman, if sufficiently careful to keep his herd free from tuberculosis or to eradicate tuberculosis, if it has once been introduced, is likely to be so progressive as to keep the various details of his farm and dairy work up to a high standard. Of course this observation does not hold good in localities where there is little tuberculosis of cattle and where the freedom of a herd from infection is a matter of good luck rather than of careful planning and administration.

While most of the facts in regard to tuberculosis of cattle that are essential to herd owners in their efforts to protect their cattle against this disease are rather widely known, there is still, in some quarters, need for further promulgation of information on this subject. This is due to the distorted or false statements regarding tuberculosis that have been distributed during the past few years from certain sources having selfish ends to serve.

The position that the representatives of the State Livestock Sanitary Board have taken in regard to tuberculosis has always been conservative. There has been no effort, in Pennsylvania, to force farmers, against their will, to have their herds tested with tuberculin, or to have cattle that have reacted to tuberculin destroyed. The tuberculin test of herds in this State has always been voluntary and owners of reacting cattle in early stages of tuberculosis have always been encouraged to keep these animals and to use them subject to the principles and precautions of the Bang or Danish system. The only compulsion that exists in regard to the use of tuberculin is that in relation to the inspection of dairy cows and cattle for breeding purposes brought into Pennsylvania from other states. The only compulsion that exists in regard to the destruction of tuberculous cattle applies to cows that have tuberculosis of the udder, or to animals afflicted with the disease in an extensive or generalized form. The disagreements and disputes that have occurred in some other states between the veterinary sanitary authorities and herd owners have been notable for their absence in Pennsylvania.

When a farmer realizes what tuberculosis of cattle is and what its prevalence in his herd means to him, he is quite as anxious to get rid of the disease as the public can be that he shall do so. If herd owners have, in some instances, been tardy in reporting tuberculosis or in taking effective measures to eradicate it from their herds, it has been because they were misinformed in regard to the disease and its significance, or because the resources of the State Livestock Sanitary Board were not sufficient to furnish them the aid and assistance that they desired. If appraisements for reacting cattle could be made on such a basis as to allow about three-fourths of the actual value of such animals, they would run at an average of about $40.00 per head, excepting in pure bred herds, where they would be higher. If appraisements could be made on this basis, the requests from owners for assistance in eradicating tuberculosis from their herds would be very numerous, as is shown by the fact that under present conditions there are now on file more than nine hundred applications from herd owners in excess of a number that can be responded to, on account of insufficient appropriation. If appraisement could be made on such a basis as indicated above, the cost to the State for its work in the eradication of tuberculosis of cattle would be from $150,000.00 to $200,000.00 a year. The appraisements for cattle destroyed have always been far below the real value of the cattle and it is necessary, with the very small appropriation now available, and the great demand of farmers for assistance, that the average appraisement shall be lowered still more in order that the maximum number of farmers may be helped to some extent. At present, the resources are so limited that it is not possible to eradicate tuberculosis from one-half of the herds that are reported by their owners with requests for assistance.

Tuberculosis has been spreading among cattle for a long term of years. Its spread is very insidious and it is frequently impossible to ascertain when a given herd became infected. Of course it is known that the chief mode of distribution is through the transfer of infected cattle from one herd to another, but an animal may be infected for a long time and may be spreading tubercle bacilli in large quantities without showing external signs of disease. It is only by the use of the tuberculin test that such animals can be detected and danger from them avoided. Therefore, it has not been possible, until recently, for farmers to avoid the infection of their herds, however great their care may have been, however good the sanitary condition of their buildings, however well the cattle were fed and cared for, as it is only by the detection and exclusion of the first infected animal that this could be done and this was impossible without the tuberculin test. Hence, the condition that exists is, to a very large extent, one for which herd owners are not responsible, and the extinction of tuberculosis among cattle is demanded for the protection of the livestock industry and the public health, that is, on public grounds, it is but right that the public should share the cost and the loss of this work.

While the introduction of bovine tuberculosis and a large part of its distribution have been unavoidable, the same excuse cannot now be offered for the herd owner who knowingly propagates the disease by permitting it to continue in his herd or by selling infected cattle.

It would seem to be just for the State to offer to eradicate tuberculosis from herds at public expense and to hold this offer open for a certain time, say ten years, and afterwards require herd owners to keep their herds free from tuberculosis at their own expense. The cost to the State under this plan might be from $3,000,000 to $4,000,000, distributed over a period of ten years. The advantage of the plan would be that that it would provide a limit to the period during which this expense would continue; it would permit all owners of diseased herds to free their herds from infection with little loss and it would place the responsibility for further losses from tuberculosis where they would belong.

In such a plan the animals not showing external signs of tuberculosis should be disposed of through the slaughter house, subject to competent meat inspection. The modified Danish system might be used, as originally described and recommended in previous reports, consisting in gathering together on certain farms reacting cattle from several herds with the view of keeping them and using them under such conditions that they may return a certain amount of profit without risk that they may spread disease. The vaccination of cattle against tuberculosis would also enter prominently into such a plan.

The work that is now being done in relation to tuberculosis of cattle is producing marked results and there is a steady diminution in the prevalence of tuberculosis throughout the State, as is shown by such fragmentary and composite evidence as is available. But the problem is too large for the present machinery. It is unsatisfactory to this office to be able to do so little when so much is asked for and required. It is unsatisfactory and disappointing to herd owners to be told that their herds cannot be tested and tuberculosis eradicated from among their cattle on account of the limited resources of the Board. If more money for this work cannot be found, then the present plan must continue; it is giving good results and is carrying us steadily, although slowly, in the right direction. There can be no doubt, however that it would be good public policy to respond more fully to the demands from every quarter that tuberculosis of cattle shall be repressed at a more rapid rate than is now possible.

RABIES. During the past year the presence of rabies has been reported in the following named counties: Adams, Allegheny, Armstrong, Beaver, Berks, Butler, Bucks, Cambria, Chester, Columbia, Delaware, Fayette, Greene, Indiana, Lackawanna, Lancaster, Luzerne, Monroe, Montgomery, Philadelphia, Susquehanna, Venango, Washington, Westmoreland and Wyoming. It will be seen that twenty-five counties have been involved. The greatest number of cases have occurred in the counties of Delaware, Chester and Westmoreland. Seven hundred and tweny-nine dogs have been destroyed on account of infection by rabies or violation of quarantine. General quarantines were established in sixteen districts. These quarantines apply to all dogs in prescribed districts and remain in force 100 days. Five hundred and sixty-nine dogs were quarantined by the service of individual notices upon their owners.

Where rabies is reported, an effort is always made to secure the head of the suspected animal for laboratory examination. It may be shot or otherwise destroyed by any one. Where the quarantined district includes a city or borough, an effort is always made to secure the cooperation of the city or borough authorities in the establishment and enforcement of the quarantine within their field of jurisdiction.

By these means, extensive outbreaks of rabies have been prevented during the past year. The disease, however, is widely distributed and it is only by constant watchfulness that it is kept from spreading extensively.

There have been numerous instances during the year that have shown the importance and value of the quarantine that have been established. Dogs muzzled or confined have often developed rabies after they were placed under restraint. When it was found that they were afflicted with rabies they were, of course, destroyed, and as they had no opportunity to bite other animals they did not become factors in the dissemination of the disease.

Some well meaning but misinformed persons oppose the quarantine, muzzling, or confinement of dogs during outbreaks of rabies because they contend that this restraint may produce rabies in the restricted animals. There is not one particle of evidence that can possibly be found to support such ridiculous views, which are totally erroneous. Rabies has been entirely exterminated in England, where it prevailed extensively for many years, by a general, compulsory muzzling order. All dogs in England were required to be muzzled or kept under proper restraint. Those that became infected with rabies were unable to convey the disease to other dogs and so rabies became extinct.

While all mammals are subject to rabies, the dog is the chief factor in the dissemination and perpetuation of the disease. It is not possible for other animals, if rabid, to roam and convey infection to the extent that the dog does, therefore if rabies were fully controlled in dogs it would soon die out among other species of animals.

It may seem to be trivial, but it is necessary to again remark that rabies is produced only by inoculation, and usually from the saliva, that is, by the bite of a rabid animal. It is not a disease that originates spontaneously or that is produced by any other cause than direct or indirect inoculation from an infected beast. Therefore, when rabies is once extinguished within a district or country it does not re-appear unless the virus of the disease is brought in from without and the virus is thus transferred in the body of an infected animal.

This knowledge as to the impossibility of the spontaneous origin of rabies and as to the way in which it is distributed is not at all discredited by the fact that there is no knowledge as to the probable origin of the disease. What we know, beyond peradventure, is that rabies cannot occur without the occurrence of a previous case from which the infection producing the existing case was derived. Just as we know that wheat cannot be grown unless wheat is planted, we know that rabies cannot occur unless the virus of the disease is implanted in the tissues of a susceptible animal. We do not know where the first case of rabies came from, nor do we know the source of the first wheat planted. These facts are being more widely distributed and accepted and this makes it possible to secure more active co-operation from the public in the enforcement of rabies quarantines.

If rabies is diagnosed by this means, or if other evidence of the existence of rabies is such as to furnish reasonable ground for belief that rabies has actually occurred, then a quarantine is established covering all dogs that have been exposed to contact with the rabid dog. If the history and conditions surrounding the case are such as to make it possible to locate all of the exposed animals, these animals are then quarantined by the service of special individual quarantine notices upon their owners. If, however, the rabid dog has been at large and his course cannot be actually traced, as is so often the case, then a general quarantine is established affecting all dogs in the district that has been travelled over by the rabid dog. Such general quarantines are established by proclamation. The order of quarantine is published in two newspapers printed in the county of the quarantined area, and copies of the quarantine notice are posted conspicuously throughout the district involved.

The laboratory of the State Livestock Sanitary Board is always ready to receive the bodies or heads of animals that have died under such circumstances that, as to denote they may have been affected with rabies. In sending such material to the laboratory, the head should be severed from the body as soon as possible after death. It should then be wrapped in oilcloth, parchment paper, rubber or other water proof material and should be placed in a large bucket, surrounded by cracked ice and sent at once to the laboratory of the State Livestock Sanitary Board, 39th street and Woodland avenue, Philadelphia. A letter addressed to the State Veterinarian should accompany the specimen or should be forwarded in the same mail. This letter should give information as to conditions surrounding the case. By the newer methods of examination, it is possible quickly to tell, in most instances, whether the animal from which the speciment was taken was affected with rabies or not. If the animal was so affected, then it is possible promptly to take such precautions as may be necessary to prevent the further spread of disease, and if it is found that the animal was not affected with rabies, then a great deal of unnecessary expense and anxiety are avoided.

Respectfully submitted,

LEONARD PEARSON,

State Veterinarian.

REPORT OF THE ECONOMIC ZOOLOGIST.

HARRISBURG, PA., *January 1, 1908.*

Hon. N. B. Critchfield, *Secretary of Agriculture, Harrisburg Pa.:*

Sir: I have the honor to submit to you the Annual Report of the Division of Zoology for the year, 1907.

During the past year the work of this office has been prosecuted with as much vigor as possible, and with results that are certainly successful, as shown by the many communications received, and by the improved condition of orchards due to greatly increased knowledge of methods of fighting insect pests in this State.

Five years ago when the present Economic Zoologist entered this office there was very little indeed known in this State concerning spraying. The number of spray pumps in use did not average four in each county; trees were dying by the thousands from the deadly effects of pests, orchards were neglected and orchardists were discouraged; farmers had ceased to plant new orchards, the sales of the nurserymen were running low, tree agents were finding great difficulty to dispose of their wares, almost no fruit trees, as a rule, were being sold, fruits were imperfect in quality and high in price, and the outlook for orcharding was very discouraging.

Recognizing the conditions and the work necessary to remedy them, the present Economic Zoologist undertook a series of experiments and demonstrations, showing how to control insect pests, with special reference to the deadly and destructive San José Scale. We continually advocated liberal use of the boiled Lime-sulfur Wash, and as fruit growers commenced to try the methods recommended, all were astonished at the results obtained. They found by one thorough application that they could check the pest and restore the trees to fair condition of growth. Tens of thousands of trees, peach especially, have been made fruitful in this State within the second year after the application of the remedy prescribed. The San José Scale is now under satisfactory and practically perfect control of fruit growers, and the men engaged in this important occupation have taken renewed courage and greater interest in their business. They have purchased spraying apparatus to the extent of scores in each county, and have sought information to a remarkable degree, educating themselves in the life histories of insect pests, methods of preserving beneficial species and destroying obnoxious kinds, and of applying practical remedies to save their crops. They are now seeing the profitable results of intelligent activity.

More extensive orchards are being planted in this State at present than ever before; nurserymen have told us during the past year that their sales of trees amounted to more than during the total five years previous; a new business has been established in the sale of spraying apparatus and commercial insecticides of various kinds, and a new profession has come into existence in that of the commercial tree sprayer. Three or four years ago at a public meeting in Lancaster we recommended as a solution of the San José Scale problem, that some person in each township or borough equip himself with a good power spraying apparatus and go into the business of spraying orchards, or that several persons in a neighborhood unite to buy a really good outfit, form a partnership and do their own spraying at such times as is necessary to give best results. At that time these recommendations were opposed by a prominent fruit grower in the State on the basis that the spraying season is so short that it would not pay, as several persons would want the apparatus at one time, and, on the other hand, no one would want it excepting during a few days only. It has since been proven that spraying for the San José Scale can be done successfully at any time when the trees are dormant or the leaves are off, and that there is ample time for dozens of persons to use the same apparatus and have as good results as they should desire.

The possibility of a prolonged period of spraying for the San José Scale, and even for other objectionable insect pests, has been fully demonstrated, and consequently the profession of the commercial sprayer has developed. Each year, from every township where fruits are grown, there continues to be a demand for some person equipped with apparatus to do the work of spraying for pests in the proper season, at fair compensation, and thus make good profits. To assist in this work we have prepared a list of names and addresses of persons whom we have learned are engaged in the good work of commercial spraying. This list has been published in our Monthly Bulletin, and at present is as follows:

COMMERCIAL SPRAYERS.

The following is a list of names and addresses of persons who will furnish apparatus and do commercial spraying. If others are known we shall be glad to learn of them.

Bedford County.

Mr. Todder, Bedford, Pa.
Mr. L. O. Walter, New Enterprise, Pa.

Berks County.

Mr. Jeremiah Gressley, Rockland, Pa.
Mr. Henry Miller, Shoemakersville, Pa.
Mr. W. P. Ruth, Sinking Springs, Pa.
Mr. J. S. A. Schaeffer, North Heidelberg, Pa.
Mr. J. H. Giles, 123 S. Fifth St., Reading, Pa.
Mr. W. K. Hummelreich, Blandon, Pa.
The Board of Poor Directors at Shillington have a Niagara outfit which they will rent.

Blair County.

Mr. N. A. Rhodes, Tyrone, Pa.

Bucks County.

Mr. Mahlon Gross, Fountainville, Pa.
Mr. H. L. Shelly, Quakertown, Pa. (50c per tree).
Mr. Jos. T. Diehl, Perkasie, Pa., R. No. 2.
Mr. E. H. Alderfer, Souderton, Pa. Bell 19W. 2 machines.
Mr. Charles Rickert, Perkasie, Pa.
Mr. S. M. Rosenberger, Blooming Glen, Pa.

Centre County.

Mr. A. M. Breon, Millheim.

Chester County.

Mr. Dennis Gallagher, Strafford, Pa.
Mr. J. D. Thomas, Whitford, Pa.
Mr. Chas. S. Coates, Nottingham, Pa.
Mr. J. T. Clarke, West Chester, Pa.
Mr. Elias Jones, Malvern, Pa., Box 57.

Clearfield County.

Mr. W. P. Tate, Curwensville, Pa.

Clinton County.

Mr. H. S. Bollinger, Lock Haven, Pa.

Cumberland County.

Mr. John Hale, New Cumberland, Pa.
Mr. Kast, Mechanicsburg, Pa.
Mr. John H. Myers, Dickinson, Pa.

Dauphin County.

Mr. J. R. Snavely, Harrisburg, Pa.
Mr. E. B. Mitchell, Harrisburg, Pa.
Mr. Roy P. Walter, Berrysburg, Pa.

Delaware County.

Mr. Jordan C. Cavener, Media, Pa.
Mr. N. P. Suplee, Collingdale, Pa.

Franklin County.

Mr. W. H. Stewart, Roxbury, Pa., Box 12.

Fulton County.

Mr. Robert L. Jackson, McConnellsburg, Pa.

Lackawanna County.

Mr. Clark (Florist), Scranton, Pa.

Lancaster County.

Mr. Jacob Chambers, Lancaster, Pa. Care of Dr. S. T. Davis.
Mr. D. P. Bricker, Lititz, Pa.
Mr. A. F. Trout, Quarryville, Pa.
Mr. C. D. Herr, Cresswell, Pa.
Mr. G. B. O. Felty, Millersville, Pa.
Mr. B. F. Barr, Lancaster, Pa.
Mr. J. Wilmuth, 735 E. Orange St., Lancaster, Pa.
Mr. Menno E. Shirk, Stevens, Pa.
Mr. Moses Lapp, Gap, Pa., R. F. D. No. 2.
Mr. Harlan Gatchell, Peters Creek, Pa., R. F. D.
Mr. E. Eshleman, West Willow, Pa., R. No. 2.
Mr. John H. Weaver, New Holland, Pa., R. F. D.
Mr. John Kensinger, Leola, Pa.
Mr. Wesley Brook Hart, Lititz, Pa.
Mr. John Reist, Mt. Joy, Pa.
Mr. Phares Martin, Reidenbaugh's Store, Pa.

Lycoming County.

Mr. Wolf, Williamsport, Pa.
Mr. Hamilton, Williamsport, Pa.

Mifflin County.

Mr. J. P. Arnold, Milroy, Pa., R. F. D. No. 183.

Monroe County.

Mr. Randall Bisbing, E. Stroudsburg, Pa.

Montgomery County.

Mr. D. M. Ellis, Bridgeport, Pa.
Mr. H. E. Wohlert, Bala, Pa.

Mr. John M. Markley, Lansdale, Pa., L. B. 245.
Mr. J. K. Schwenk, Providence Square, Pa.
Mr. W. E. Baker, Skippack, Pa.
Messrs. Miller and Baker, Hatfield, Pa.
Mr. E. H. Bernd, Tylersport, Pa.
Mr. Jos. D. Detwiler, Souderton, Pa., R. D. No. 1.
Mr. Calvin Hart, Lafayette Hill, Pa.
Mr. C. K. Milford, 1041 Green St., Norristown, Pa.
Mr. T. P. Dutton, Willow Grove, Pa.
Mr. Raymond Hoot, West Point, Pa.
Mr. W. O. Carver, Lansdale, Pa.
Mr. G. W. Shunk, Lower Providence, Pa.
Mr. John Toomey, Conshohocken, Pa.
Mr. G. L. Oddy, Centre Square, Pa.
Mr. Wm. Sturzwecher, Lansdale, Pa.
Mr. Peter Reilly, Rosemont, Pa.

Northampton County.

Mr. L. E. Graver, Easton, Pa., R. No. 1.
Mr. J. N. Hartzell, E. Bangor, R. F. D. No. 43, Pa.
Mr. Ervin S. Lambert, Easton, Pa., R. No. 4.

Northumberland County.

Mr. F. A. Newcomer, Milton, Pa.
Mr. Chas. Diehl, Pottsgrove, Pa., R. F. D.

Philadelphia County.

Thos. Meehan & Sons, Mt. Airy, Phila., Pa.
Mr. Herbert Inman, 2419 N. College Ave., Phila., Pa.
Mr. F. C. Peters, 157 N. 20th Street, Phila., Pa.
D. H. Kyler & Co., Germantown, Pa.
Scientific Spraying Co., 5104 Brown St., Philadelphia, Pa.

Schuylkill County.

Mr. Al. Kimmel, Orwigsburg, Pa.
Mr. J. L. Heine, Orwigsburg, Pa.

Snyder County.

Mr. Albert Dreese, Beaver Springs, Pa.
Mr. W. H. Bingaman, Beavertown, Pa.
Mr. J. J. Tobias, Beavertown, Pa.
Mr. J. Shamback, Swineford, Pa.
Mr. E. A. Shafer, Port Trevorton, Pa.

Union County.

Mr. H. A. Taylor, Mifflinburg, Pa.
Mr. Geo. Kunkel, Lewisburg, R. No. 1, Pa.
Mr. Solomon Dewalt, W. Milton, Pa.

Westmoreland County.

Mr. J. N. Woolman, Greensburg, Pa.

York County.

Mr. John O. Gardner, 25 E. King St., York, Pa.
Mr. Marion Thomas, Delta, Pa.
Mr. Howard Anderson, Stewartstown, Pa.
Mr. John H. Baird, Stewartstown, Pa., R. No. 1.
Mr. John F. Stern, Sunnyburn, Pa.
Mr. John H. Budd, York, Pa.
Mr. D. Barnett, Woodbine, Pa., R. F. D.
Mr. O. K. Burkins, Woodbine, Pa., R. F. D.
Mr. Edward Hetrick, Dallastown, Pa.
Mr. Howard Miller, Red Lion, Pa.
Mr. John Taylor, Dallastown, Pa.
Fauth Bros., Wrightsville, Pa., R. D. No. 1, Box 107.
Mr. A. E. Houseal, Red Lion, Pa.
Mr. John Spangler, Red Lion, Pa.

After orchardists once spray, they find the results so very gratifying in saving their fruit crops and producing first class fruits, where formerly they produced only culls, that they are now purchasing and using apparatus, studying the subject of fruit production, buying and planting trees and showing a general horticultural awakening such as this State has not known for many years.

In Volume I, Number 1, of our Monthly Bulletin of the Division of Zoology, we announced the features of the work that would be undertaken by this office. Among these were the examination of specimens and answers to questions sent, personal work of investigation and experimentation, publications, lectures, inspection of nurseries and private premises, inspection of imported plants, seeds and fruits, and the making of collections. These features of the work of the office have been faithfully executed to such extent as has been found advisable and possible during the past year, with the addition of extensive orchard inspection, and the establishment of demonstration orchards in some of the different counties of this State.

DEMONSTRATION ORCHARDS.

The citizens of Pennsylvania have justly asked to be shown the methods of doing things which were new to them. We believe there is nothing equal to the demonstration method to bring the desired results. Consequently we have established demonstration orchards at the following places:

County.	Owner.	Place.	Demonstrator in Charge.
Allegheny,	J. W. Nesbit,	Oakdale,	G. W. Sloop.
Bedford,	Bedford County Home,	Bedford,	R. F. Lee.
Berks,	Berks County Home,	Shillington,	L. C. Bowers.
Bucks,	National Farm School,	Farm School,	E. L. Loux.
Butler,	County Home,	Butler,	Frank L. McClure.
Cambria,	County Home,	Ebensburg,	R. F. Lee.
Chester,	County Home,	Embreeville,	Francis Windle.
Clearfield,	County Home,	Clearfield,	R. F. Lee.
Columbia,	Bloom Poor Dist.,	Bloomsburg,	A. W. Stephens.
Cumberland,	Indian School,	Carlisle,	F. Z. Hartzell.
Dauphin,	County Home,	Harrisburg,	P. H. Hertzog.
Delaware,	County Home,	Lima,	M. E. Shay.
Huntingdon,	Reformatory,	Huntingdon,	J. Bergy.
Indiana,	Frank Daugherty,	Indiana,	G. W. Sloop.
Lackawanna,	Randolph Crippen Estate.	Dalton,	A. O. Finn.
Lancaster,	Home for Friendless Children.	Lancaster,	J. D. Herr.
	County Home,	Lancaster,	J. D. Herr.
Lebanon,	County Home,	Lebanon,	F. R. Fertig.
Lycoming,	City Home,	Williamsport,	T. C. Foster.
Mifflin,	County Home,	Lewistown,	J. Bergy.
Montgomery,	State Asylum,	Norristown,	J. S. Briggs.
Montour,	Pa. Insane Hospital,	Danville,	A. W. Stephens.
Northampton,	Carter Junior Republic,	Redington,	P. R. Boltz.
Northumberland,	Odd Fellows' Orphans' Home.	Sunbury,	A. W. Stephens.
Perry,	County Home,	Loysville,	T. C. Foster.
Potter,	County Home,	Coudersport,	M. L. Benn.
Tioga,	G. T. Hatherill,	Wellsboro, R. D. 1,	M. L. Benn.
Union,	J. N. Glover,	Vicksburg,	T. C. Foster.
Venango,	Inst. for Feeble Minded,	Polk,	F. L. McClure.
Westmoreland,	County Home,	Greensburg,	G. W. Sloop.

It is our purpose to continue these demonstration orchards during 1908 and 1909, and to establish others. It is now evident that no work we have yet started will prove so important, helpful and practical as this. Demonstrations are given showing the present or modern methods of orchard practice to produce first-class fruit, free from injury by insect pects or plant diseases. Announcements are made through the press and otherwise concerning the dates of the demonstrations, and interested persons are invited to attend. The attendance often is large and the citizens take great interest in the work and express themselves as having received great help from the same. The final results can not be seen within two or three years, but by next year we shall be able to show what can be accomplished in the practical renovation of old, diseased and worn-out orchards.

ORCHARD INSPECTION.

Orchard inspection has been the chief means of coming into contact with the public and rendering direct personal services. We have had about thirty different persons on the inspecting force. Their duty was to inspect private premises, in order to report to this office the kinds of pests found and the varieties of fruits infested. We, in turn, send notification of pests present and instructions as to the proper treatment to destroy them. This, combined with the demonstration orchard system, is resulting in the preservation of orchards as no other means could have done.

The detailed reports of the inspection for 1907 are as follows:

DETAILED REPORTS OF ORCHARD INSPECTIONS FOR 1907.

Report of inspections by counties and inspectors giving (a) number of demonstrations; (b) total number of persons in attendance at demonstrations; (c) number of orchard or rural inspections; (d) number of borough inspections; (e) number of rural premises found infested with San José Scale; (f) percentage of rural premises infested with San José Scale; (g) number of fruit trees represented in rural inspections in 1905 and 1906; (h) number of fruit trees represented in rural inspections in 1907.

County.	Inspector.	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
*Adams,	D. K. McMillan,	11	166		205				
Allegheny,								85,053	
Armstrong,								14,822	
Beaver,	A. L. McKibben,			581		2	0.00	8,416	86,506
Bedford,	R. F. Lee,	12	133	851	495	313	36.8	154,239	251,132
Berks,	J. D. Herr,	10	176	627	677	600	95.7	29,594	59,601
	R. F. Lee,			6	585	5	83.33	38,965	15,017
Blair,	J. Bergy,			93		4	4.3		
Bradford,	W. B. Packard,							45,742	
	J. S. Briggs,	3	139						
Bucks,	E. L. Loux,	11	222	1,638		1,497	85.9	3,965	121,171
Butler,	F. L. McClure,	4	56	1,551	25	55	3.54	10,161	171,347
Cambria,								24,557	
Cameron,								2,224	
Carbon,								13,233	
	C. C. Hess,	2	18	4		3	75.	62,943	440
Centre,	T. C. Foster,				227				
	E. L. Loux,	8	87	438	1,151	362	82.65	61,368	137,382
Chester,	F. Windle,	8	121	1,396	663	1,372	98.28		
Clarion,								13,947	
Clearfield,									3,825
Clinton,	A. T. Baird,							40,751	63
Columbia,								44,926	
Crawford,								6,350	
	F. Hartzell,	8	92	128		105	82.03	151,613	19,248
Cumberland,	W. H. Wolff,				222				
	P. H. Hertzog,	11	170	310	83	254	81.93	64,317	
Dauphin,	C. F. Noll,			15	22	15	100.		
Delaware,	M. E. Shay,	8	168	359	30	321	89.66	19,294	32,311
Elk,								2,997	
Erie,	W. F. Lewis,			31		1	3.22	134,025	2,306
Fayette,								8,875	
Forest,								8,848	
Franklin,	F. Z. Hartzell,	4	26		301			238,457	
Fulton,	F. Z. Hartzell,			12		3	25.	4,469	21,741
Greene,								6,459	
Huntindon,	J. Bergy,			38		7	18.42	95,616	12,675
Indiana,	G. W. Sloop,	8	98	599	292	5	0.83	9,508	94,079
Jefferson,								24,417	
	J. Bergy,	4	43	998	92	516	51.70	27,712	115,497
Juniata,	T. C. Foster,	3	12	89		50	56.18		
	J. K. Owen,	4	60					11,495	130,335
Lackawanna,	A. O. Finn,			1,376	188	60	4.36		

Lancaster,	E. C. Bowers,	17	199	898	415	898	100	99,408	67,817
	J. D. Herr,	10	159	313	57	11	3.51	....	....
	P. H. Hertzog,	....	....	....	41	....	....	....	....
Lawrence,	J. W. Cox,	1	5	413	....	28	6.78	57,734	47,389
Lebanon,	F. R. Fertig,	9	237	1,058	63	1,051	99.31	31,126	99,783
Lehigh,	E. C. Bowers,	....	....	348	....	348	100.	51,653	27,173
Luzerne,	J. K. Owen,	5	81	921	274	203	22.04	32,845	110,235
	A. W. Stephens,	1	52	5	....	2	40.	....	....
Lycoming,	C. E. Myers,	....	....	396	163	216	54.55	93,157	121,504
	A. W. Stephens,	1	16	....	....	....	....	....	....
	W. G. Winner,	24	321	729	381	84	11.52	....	....
Mercer,	J. W. Cox,	3	34	101	....	12	11.88	116,906	9,864
Mifflin,	J. Bergy,	....	....	....	65	....	....	32,169	....
Monroe,	....	....	....	....	....	....	....	93,458	....
Montgomery,	J. S. Briggs,	22	404	868	418	787	90.67	57,857	81,835
	M. E. Shay,	....	....	....	34	....	....	....	....
Montour,	A. W. Stephens,	2	11	31	1,029	30	96.77	74,289	1,478
Northampton,	P. R. Boltz,	6	102	579	....	554	95.68	49,020	45,218
Northumberland,	A. W. Stephens,	9	92	561	789	404	72.01	29,766	57,910
	P. H. Hertzog,	....	....	....	405	....	....	....	....
Perry,	T. C. Foster,	1	9	....	....	....	....	82,015	....
Philadelphia,	M. E. Shay,	7	83	194	484	163	84.02	22,076	47,319
Pike,	W. E. Perham,	....	....	....	....	....	....	6,061	....
Potter,	M. L. Benn,	3	35	809	110	....	0.0	163,890	....
Schuylkill,	B. S. Moore,	....	....	667	....	337	50.52	150,092	250,499
	P. H. Hertzog,	....	....	....	528	....	....	....	....
Snyder,	T. C. Foster,	20	163	986	688	277	28.09	139,898	185,029
Somerset,	H. H. Dutton,	....	....	....	....	....	....	8,622	....
Sullivan,	C. E. Myers,	....	....	656	195	100	15.24	3,171	50,879
Susquehanna,	A. O. Finn,	....	....	105	....	1	0.95	8,258	56,867
Tioga,	M. L. Benn,	....	....	2	....	....	0.0	13,727	338
Union,	T. C. Foster,	4	70	....	829	....	....	103,178	....
Venango,	J. W. Cox,	....	....	....	....	....	....	14,754	....
Warren,	F. Z. Hartzell,	....	....	....	....	....	....	28,550	....
Washington,	J. Fergus and W. S. Fisher,	....	....	....	....	....	....	9,622	....
Wayne,	W. E. Perham,	....	....	....	....	....	....	30,208	....
Westmoreland,	J. N. Woolman,	....	....	674	....	294	43.62	11,324	87,958
Wyoming,	D. A. Knuppenburg,	....	....	1,403	528	142	10.12	30,784	130,000
	J. K. Owen,	5	60	....	....	....	....	....	....
York,	E. F. Peirce,	7	134	475	57	434	91.37	70,877	26,087

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*A number of good fruit-producing counties, like Adams and others, are to be thoroughly inspected this spring.

LICENSED TREE DEALERS.

It is necessary for each tree dealer in Pennsylvania to procure a license or certificate from the Department of Agriculture, permitting him to transact his business in this State. However, it is not necessary for the tree agent to obtain such license.

The difference between the tree agent and tree dealer is, that the former represents one nursery, acting for them upon commission and not handling any stock beside that for which he has direct orders. Of course it is impossible for any nursery to transact business or sell or deliver stock in this State, without a license, and consequently the person who is acting as direct agent for any nursery is selling under the license or certificate of his firm. Thus the agent is regarded as holding a license by virtue of the one which his firm must obtain to transact business in the State.

By the term "Tree Dealer" we refer to persons who make a business of buying nursery stock from various places and selling it again upon his own responsibility or under his own name. Whenever we learn of a tree dealer in this State, we ascertain of him the names and addresses of the firms from which he procures his stock, and we then write to the State Nursery Inspectors in the respective states given and learn if the nurseries named have been inspected, and if the firms have in every way complied with the rquirements of the law in their states, and if they have a certificate for selling nursery stock according to the regulations of the said state or states. Upon obtaining this information, if all is favorable, a certificate is sent from this office to the tree dealer to sell stock from those nurseries which we have investigated and found to have certificates, but from those only. If it be found that any nursery, the dealer named, in any State whatever, has not complied with the legal requirements of said state and does not have a certificate for the selling of stock in its own state, the tree dealer is refused a certificate to sell stock from that nursery.

Any tree dealer in this State should consequently be able to show his certificate from this office and any agent should have credentials signed by the nursery which he represents, and which he can show. He should also be able to show conclusive evidence that his nursery holds a certificate of inspection in the state where the stock is grown.

The following is a list of licensed tree dealers in Pennsylvania at this date:

ALLEGHENY COUNTY.

C. F. Halfast, Wilkinsburg, Pa.
H. M. Devereaux, Swissvale, Pa.
W. B. Bockstose, Castle Shannon, Pa.
L. F. Miller, 1023 Garret St., Pittsburg, Pa.
E. C. Hauser, Bellevue, Pa.
Charles Honess, Allegheny, Pa.
J. F. Zimmerman, Emsworth, Pa.
J. M. Fails, 1807 Runette Ave., Pittsburg, Pa.

BEAVER COUNTY.

J. C. Withrow, Vanport, Pa.
J. H. Gutermuth, Rochester, Pa.
A. E. Crouch, Rochester, Pa.

BERKS COUNTY.

Jacob H. Wieand, Reading, Pa.
M. E. Smeltzer, Reading, Pa.
Alfred Driebelbis, Reading, Pa.
L. M. Neischwender, Hamburg, Pa.

BLAIR COUNTY.

James Hopkins, Juniata, Pa.

BRADFORD COUNTY.

J. F. Gable, Athens, Pa.
Jos. E. Hamilton, R. D. No. 16, Rome, Pa.
J. P. Sibley, R. D. No. 16, Rome, Pa.

BUCKS COUNTY.

A. P. Krautz, Silver Dale, Pa.

BUTLER COUNTY.

Geo. W. Haine, R. D. No. 32, Callery, Pa.

CARBON COUNTY.

Paul Neihoff, Lehighton, Pa.
David N. Rehr, Lehighton, Pa.
L. B. Wagner, Weissport, Pa.

CHESTER COUNTY.

John Alcorn, Malvern, Pa.
F. W. Richardson, Paoli, Pa.

CLEARFIELD COUNTY.

Thos. W. Munro, DuBois, Pa.

CLINTON COUNTY.

W. W. Richie, Lock Haven, Pa.

CRAWFORD COUNTY.

J. C. Boyd, Guy's Mills, Pa.
F. M. Fleming, Cochranton, Pa.

CUMBERLAND COUNTY.

Ira A. Bigler, Camp Hill, Pa.
D. C. Rupp, Shiremanstown, Pa.
Towzer & Wolff, Carlisle, Pa.

DAUPHIN COUNTY.

A. H. Shreiner, Harrisburg, Pa.
Geo. F. Greenawalt, Hummelstown, Pa.
T. A. Woods, Harrisburg, Pa.
J. R. Snavely, Harrisburg, Pa.
J. M. Christman, Fort Hunter, Pa.

DELAWARE COUNTY.

John Wetherill, Chester, Pa.

ERIE COUNTY.

E. Hogoboom, Girard, Pa.
W. S. Waldo, North East, Pa.
C. E. Powell, Lundy's Lane, Pa.
W. C. Batchelor, Erie, Pa.
F. S. Powell, Lundy's Lane, Pa.

FRANKLIN COUNTY.

J. W. Heffelfinger, Greenvillage, Pa.

FULTON COUNTY.

S. M. Robinson, McConnellsburg, Pa.
Lewis H. Wible, McConnellsburg, Pa.

LACKAWANNA COUNTY.

Giles L. Clark, Scranton, Pa.
A. J. Noble, Scranton, Pa.

LANCASTER COUNTY.

J. S. Holwager, Elizabethtown, Pa.

LEBANON COUNTY.

Samuel P. Moyer, Myerstown, Pa.
M. D. M. Batdorff, Myerstown, Pa.

LEHIGH COUNTY.

N. C. Beachy, Allentown, Pa.

LUZERNE COUNTY.

W. H. Lanyan, Hazleton, Pa.
H. M. Rogers, Dallas, Pa.
Geo. W. Long, Sweet Valley, Pa.

McKEAN COUNTY.

F. S. Palmer, Bradford, Pa.

MONROE COUNTY.

L. D. Eilenberger, E. Stroudsburg, Pa.

MONTGOMERY COUNTY.

John Reig, Jenkintown, Pa.
A. E. Wohlert, Merion, Pa.
Benj. Connell, Hoyt, Pa.

NORTHAMPTON COUNTY.

T. S. Headman, Seidersville, Pa.
Dominico Sebastino, Roseto, Pa.

NORTHUMBERLAND COUNTY.

H. F. Frank, Montandon, Pa.
Jos. Harris & Bro., Shamokin, Pa.

PHILADELPHIA COUNTY.

Moore & Simon, Philadelphia, Pa.
J. R. Giffen, 1826 No. Willington Street, Philadelphia, Pa.
Wm. Henry Maule, Philadelphia, Pa.
Walter P. Stokes, Philadelphia, Pa.
Henry F. Michel Co., Philadelphia, Pa.
Hosea Waterer, Philadelphia, Pa.
Johnson Seed Co., Philadelphia, Pa.
Herbert Inman, 2419 College Avenue, Philadelphia, Pa.

SCHUYLKILL COUNTY.

Walter J. Keller, Pottsville, Pa.
W. O. Snyder, Minersville, Pa.
D. H. Smith, Haas, Pa.

SUSQUEHANNA COUNTY.

J. H. Tiffany, Hopbottom, Pa.

TIOGA COUNTY.

Arthur Edwards, Elkland, Pa.
E. H. Wheaton, Knoxville, Pa.

UNION COUNTY.

J. G. Oberdorf, Mifflinburg, Pa.

WYOMING COUNTY.

E. A. Nye, Eatonville, Pa.
Russell Bros., North Mehoopany, Pa.
A. Ross, North Mehoopany, Pa.

YORK COUNTY.

C. H. Snyder, York, Pa.
J. H. Painter, York, Pa.
Henry Everhart, Manchester, Pa.

OHIO.

Jones & Vernon, Troy, Miama county, Ohio.
Myers Bros. & Co., Wilmot, Stark county, Ohio.

NURSERY INSPECTION.

Report of Nursery Inspection in Pennsylvania.

During the past year the inspection of nurseries has been pushed with more than usual vigor, during both the summer season and the winter. This is the second year that we have inspected nurseries during the wintertime, and the results are found to be so beneficial that it is determined to continue this feature of the inspection. The summer inspection commences the first of August and is continued until all the nurseries of the State are thoroughly inspected, which is generally until about the middle of September. However careful and conscientious the Inspector may be at the time of inspection, it is impossible to find all the scale insects that may be concealed beneath green leaves and buds during the summer inspection, and also there is great danger that the scale may spread after this inspection is finished and infest nursery stock which was clean at the time it was inspected.

In order to be certain to find the San José Scale and other tree pests, the February inspection is made when the trees are not in leaf, and there is a better opportunity to inspect them thoroughly and see that they are in proper condition for spring sales. The inspections have been made with greater care than ever before, and the nurserymen themselves have commended it and commented upon the thoroughness with which the present force of inspectors are doing their work. The results are gratifying to all parties concerned.

When the nursery inspection was first undertaken, some of the nurserymen were opposed to it for the reason that they thought it was interfering with their rights and property, and that they should be permitted to sell the nursery stock grown on their own land if the infestation came by means for which they were not responsible. They now fully understand that to stay in the business permanently and continued to make sales, they must of necessity sell good stock in good condition and satisfy customers. Thus they have become enthusiastic supporters of a very rigid system of nursery inspection.

The greatest evil threatening nursery stock in this State has been infested trees or shrubbery in the vicinity of nurseries, and the great danger of the San José Scale spreading readily from such trees to the nursery stock. Several cases of nursery infestation by such means were found by our inspectors a few years ago, and this justified the movement on our part to force the owners to rid their trees of such dangerous pests. As a consequence, last summer we gave considerable attention to inspecting trees and shrubs on premises in the vicinity of nurseries, and notified the owners that their property must be treated by certain means or it would be our duty to treat it or destroy it in order to get rid of the scale threatening the nurseries, nursery stock and neighbors. We are much gratified to report that in every case prompt remedial action was taken by the owners, and the results are very gratifying to all parties concerned. Nurserymen report that they have had during the past season far less infestation from scale from surrounding premises than ever before, which we believe is attributable to this method.

Where trees are found infested in a nursery this State requires the destruction of all those that are found infested by San José Scale, and the fumigation of all others from that nursery before they can be sold or shipped. There has been considerable complaint made against fumigation, some persons claiming that it injured their trees, but we know of a series of fumigation experiments which proved that three times the required dosage of one ounce of the Cyanide of Potassium to one hundred cubic feet of space resulted in no injury whatever to the trees or cuttings. It is by all means best to have nursery stock fumigated at the nursery before shipping, whether it be found infested or not. The reports adverse to fumigation have mostly come from persons who wished to be excused from the trouble of insuring, by this method, the freedom of their trees from pests.

It is against the law to ship any nursery stock, of varieties subject to attack by San José Scale, into this State from any other state or country without certificates both of inspection and fumigation being attached to each package, bale or bundle in the shipment. Persons who have an opportunity are invited to aid us in the protection of our fruit growers and farmers by watching for incoming packages at railroad stations, express offices, etc., which may not bear tags certifying both inspection and fumigation, as required by our State law. Reports of such infringement should be sent at once to the Secretary of Agriculture, with details of the facts of the case, with the name of the shipper as well as the consignee, and the railroad or express company carrying the shipment.

It is likewise illegal to sell, ship or transport any nursery stock, for any distance whatever in this State, without said stock having attached thereto a certificate of inspection, showing when and by whom it was inspected, and if it has been fumigated, a certificate or statement of fumigation must likewise be attached. Purchasers are advised to reject all shipments not tagged or labelled in accordance with these statements, and notify this office of observed infringements of the law.

The following is a list of the nurseries inspected and licensed in the State of Pennsylvania, giving the name, address, and area of each:

ADAMS COUNTY.

Name.	Place.	Acres.
H. G. Baugher,	Aspers,	1
C. A. Stoner,	Gettysburg,	3
Charles J. Wilson,	Mummasburg,	3
W. E. Grove,	York Springs,	3
H. R. Plank,	York Springs,	2
Oyler & Hartman,	Mummasburg,	3

ALLEGHENY COUNTY.

Name.	Place.	Acres.
Elliott Nursery Co.,	Springdale,	33
G. R. Elliott, Diamond Market,	Pittsburg,	1
Mark E. Head, 230 Rogers Ave.,	Bellevue,	¼
John W. Jordon,	Millvale,	¼

BEAVER COUNTY.

Name.	Place.	Acres.
Mackall Bros.,	Beaver,	15
*James Smith,	Beaver Falls,	2½
A. P. Goodwin,	Industry,	9
*J. Hoyt,	Industry,	18
*Henry Finley,	Industry,	3
*A. J. Freed,	Homewood,	7
*W. A. Freed,	Homewood,	3
*Joseph and Charles Engle, R. D. No. 2.	Beaver	14
*Arnold Bros., R. D. No. 1,	Beaver Falls,	8
*Enoch Engle, R. D. No. 1,	Beaver,	7

BEDFORD COUNTY.

Name.	Place.	Acres.
Austin Wright,	Alum Bank,	2

BERKS COUNTY.

Name.	Place.	Acres.
Wenrich Bros,	Robesonia,	½

BUTLER COUNTY.

Name.	Place.	Acres.
Pierce Bros.,	Butler,	6

BLAIR COUNTY.

Name.	Place.	Acres.
F. A. Bowser,	Newry,	¼

BUCKS COUNTY.

Name.	Place.	Acres.
J. L. Lovett,	Emilie,	3
Henry Palmer,	Langhorne,	2
Horace Janney,	Newton,	5
D. Landreth Seed Co.,	Bristol,	2
The W. H. Moon Co.,	Morrisville,	200
S. C. Moon,	Morrisville,	50
D. J. Youngken,	Richlandtown,	1
S. R. Trach, R. D. No. 1,	Springtown,	1
Jacob F. Krout, R. D. No. 1,	Perkasie,	2

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*Growers of berry and small fruit plants only.

CHESTER COUNTY.

Name.	Place.	Acres.
Morris Nursery Co.,	West Chester,	200
The Conard & Jones Co.,	West Grove,	30
The Dingee & Conard Co.,	West Grove,	15
Rakestraw Pyle, Co., The,	Kennett Square,	200
J. A. Roberts,	Malvern,	6
Hoopes Bros. & Thomas,	West Chester,	600
J. B. Reif,	Spring City,	2
E. B. Keating,	Kennett Square,	1½
Clarence Bayles,	West Grove,	½

CLEARFIELD COUNTY.

W. S. Wright,	Clearfield,	½

COLUMBIA COUNTY.

Frank C. Harris, R. F. D.,	Light Street,	½

CRAWFORD COUNTY.

*Anderson Bailey, R. D. No. 66	Cochranton,	13
*Henry Roberts, R. D. No. 66,	Cochranton,	3
*J. T. Reed, R. D. No 66,	Cochranton,	2½
*Park Bailey,	Cochranton,	4
*Samuel J Cooper, R. D. No. 58,	Cochranton,	5
*Lewis Swogger, R. D. No. 28,	Carlton,	1½
C. L. Unger, R. D. No. 11,	Meadville,	3
Pennsylvania Nursery Co.,	Shermansville,	25
*J. Q. Marsh,	Geneva,	1½
*L. L. Wood,	Geneva,	2
*Peter Schaffner, R. D. No. 2,	Meadville,	4
*James T. Irwin,	Cochranton,	1½
*Samuel Bailey, R. D. No. 66,	Cochranton,	1
Don T. Atkin, R. D. No. 41,	Linesville,	4½
*Lee Bailey,	Cochranton,	2
*Frank Wasson	Meadville,	2

DAUPHIN COUNTY.

C. P. Scholl, R. D. No. 1,	Halifax,	5
Andrew Coble, R. D. No. 1,	Middletown,	6

DELAWARE COUNTY.

P. Z. Supplee,	Collingdale,	25
J. J. Styer,	Concordville,	2
M. F. Hannum,	Concordville,	½
W. E. Caum (Lessee),	Haverford,	5
John G. Gardner,	Villa Nova,	1
Phila. Hedge Co., 817 Arcade Building,	Philadelphia or Wayne,	5
H. H. Battles,	Newtown Square,	5
Joseph H. Brinton,	Camp Ground,	¼

ERIE COUNTY.

*A. F. Youngs,	North East,	3
*Orton Bros.,	North East,	1
L. G. Youngs,	North East,	5
*D. C. Bostwick & Son,	Ripley, N. Y.,	5
*M. E. Kelley, R. D. No. 2.	North East,	4½
*A. J. Youngs,	North East,	3
*W. E. Smith, R. D. No. 3,	North East,	3½
*J. G. Bagley,	North East,	1
A. L. Brooks, R. D. No. 1,	Corry,	3
*F. C. Day,	Girard,	1½
L. C. Hall,	Avonia,	¼
H. C. Pettis,	Platea,	¼

FAYETTE COUNTY.

J. Sterling & Son,	Masontown,	1

FRANKLIN COUNTY.

Geo. H. Wirt (Forester),	Mt. Alto,	1
Henry Eicholz,	Waynesboro,	½

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*Growers of berry and small fruit plants only.

JUNIATA COUNTY.

Name.	Place.	Acres.
Jos. H. Landis,	McCullough's Mills,	2
*S. H. Graybill,	Richfield,	5
*Wm. Banks,	Mifflintown,	5

LACKAWANNA COUNTY.

*George H. Colvin,	Dalton,	2
*Floyd H. Northup,	Glenburn,	1
John W. Shepherd, 945 Clay Ave.	Scranton,	4
*Elmer E. Richards,	Baldmount,	¼

LANCASTER COUNTY.

John G. Engle,	Marietta,	6
A. H. Erb,	Lititz,	½
Maurice Brinton,	Christiana,	20
W. P. Bolton,	R. F. D. McCalls Ferry,	2
D. D. Herr,	Lancaster,	5
Wilson Kready,	Mt. Joy,	1
O. W. Laushey, R. F. D.,	Lancaster,	2
A. W. Root & Bro., R. D. No. 1,	Manheim,	20
David S. Herr, R. F. D. No. 7,	Lancaster,	3
M. H. Musser,	Lancaster,	2
Hiram Shearer,	Elizabethtown,	1
B. F. Barr & Co.,	Lancaster,	3
Frank A. Suter,	Lancaster	½
*Mayer & Son,	Willow Street,	2

LAWRENCE COUNTY.

J. W. Hayes, R. D. No. 3.	Edinburg,	1
Butz Bros.,	New Castle,	½
A. S. Moore.	New Castle	1
D. W. Fisher,	New Wilmington,	½

LEHIGH COUNTY.

W. B. K. Johnson, Estate,	Allentown,	30
Preston J. Kline,	Coopersburg,	5

LUZERNE COUNTY.

I. A. Driggs,	White Haven,	
(Handles only native ornamental shrubs.)		
Miss M. A. Maffett,	Wilkes-Barre,	1

LYCOMING COUNTY.

Evenden Bros.,	Williamsport,	1

MERCER COUNTY.

H. H. McClearn,	Stoneboro,	1
*George E. Brocklehurst, R. D. No. 20,.	Jackson Centre,	3
*J. W. & J. H. Allison, R. D. No. 10, ..	Mercer,	10
*J. T. McLean, R. D. No. 46,	Greenville,	4
*Hugh Hogue, R. D. No. 28,	Carlton,	1½
J. L. Hoobler & Son, R. D. No. 34,	Hadley,	4
W. A. Taylor, R. D. No. 46,	Greenville,	1½
W. R. Cribbs,	Mercer,	3
*H. W. Allison, R. D. No. 9,	Mercer,	4
*R. S. Donnell,	Hadley,	½

MONTGOMERY COUNTY.

Chris Koehler,	Cheltenham,	2
R. B. Haines & Co.,	Cheltenham,	4
C. H. Wilson Estate,	Gladwyne,	2
J. B. Heckler,	Landsdale,	4
J. W. Thomas & Sons,	King of Prussia,	70
J. Krewson & Sons,	Cheltenham,	22
T. N. Yates & Co.,	North Wales,	100
J. B. Moore,	Hatfield,	10
Adolph Mueller,	Hoyt,	15
T. Meehan & Sons, Inc.,	Dreshertown,	216
Wm. Sturzebecher,	Lansdale,	½
Edward D. Drown,	Weldon,	¼
Fred Shoosmith,	Hoyt,	¼
J. G. Steffin,	Norristown,	¼
Somerton Nurseries, A. W. Bannard, Mgr., 125 S. 5th St., Phila.,	Somerton,	15

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*Growers of berry and small fruit plants only.

NORTHAMPTON COUNTY.

Theodore Roth,	Nazareth,	2

PERRY COUNTY.

Geo. A. Wagner, R. F. D.,	Landisburg,	1½

PHILADELPHIA COUNTY.

W. W. Harper,	Chestnut Hill,	500
Thos Meehan & Sons, Inc.,	Germantown,	75
T. N. Yates & Co.,	Germantown,	6
John B. Lewis,	Bustleton,	10
A. F. O'Connell, 4103 Girard Ave.,	Philadelphia,	14
John Stevenson's Son,	Oak Lane,	2

POTTER COUNTY.

Geo. Jackson,	Ulysses,	1

SNYDER COUNTY.

W. J. Koch, R. F. D.,	McClure,	1
S. Steininger, R. F. D. No. 2,	McClure,	1

SOMERSET COUNTY.

M. T. Lancaster	Harnedsville,	5
H. E. Daniels,	Harnedsville,	3

SUSQUEHANNA COUNTY.

*E. A. Smith,	Heart Lake,	8
*Geo. P. Sprout, R. D. No. 66,	Montrose,	4½

UNION COUNTY.

C. K. Sober, (Nursery near Paxinos, Northumberland Co.).	Lewisburg,	6

VENANGO COUNTY.

Venango Nursery Co., R. D. No. 1,	Franklin,	6

WESTMORELAND COUNTY.

John McAdams,	Mt. Pleasant,	1

WYOMING COUNTY.

*Silas Decker, R. D. No. 1,	Ransom, Lackawanna Co.	3½
*F. H. Fassett,	Meshoppen,	1
*W. H. Swartwood, R. D. No. 1,	Ransom, Lackawanna Co.,	5

YORK COUNTY.

Patterson Nursery Co.,	Stewartstown,	18
Geo. E. Stein,	East Prospect,	6
W. S. Newcomer,	Glenrock,	4
E. J. Weiser, R. D. No. 11,	York,	½

SPECIMENS RECEIVED.

The number of specimens sent by the public to this office has been very remarkable. In fact, no state or government ever had such support of contributors and observers. Our collections now number eleven thousand, many of which stand for scores of different species. In Volume V of our Monthly Bulletin we found it necessary to devote forty-one pages to the acknowledgment of the receipt of specimens of insects, reptiles, birds, mammals, and other specimens of which the public wished to make inquiry or which we desired in our studies. Our specimens have been carefully preserved and stored in such a manner that they can be found immediately for reference or for study. They have been the basis of our more extensive investigations and are ready for further examination by students at any time.

INVESTIGATIONS AND EXPERIMENTATION.

We have continued investigations along the line of Economic Entomology, trying different remedies for San José Scale, and other pests, at different times of the year, and have tested many kinds of commercial insecticides and various home-made preparations, for the suppression of different kinds of injurious insects, as well as for San José Scale especially.

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*Growers of berry and small fruit plants only.

Our most careful and earnest investigations in regard to the San José Scale have proven more conclusively than ever before that we were right in advocating the Lime-sulfur Wash as the best possible remedy to be used, as well as the cheapest that can be obtained. A significant development during the year has been the commercial aspect of this material, and the fact that several firms are now making it and placing it on the market. We predict that the time will come when the oils, as spray liquids for insects, will be reduced to a decidedly secondary place, and orchardists will agree upon the home-made or commercial Lime-sulfur Wash, not only as an insecticide but also as a fungicide.

SPECIAL INVESTIGATIONS.

Among the important special investigations which we are now planning to undertake are the experiments in conjunction with the United States Department of Agriculture on the enemies of the grape and peach. These are to be undertaken at North East, in Erie county, Pennsylvania, where the United States Department last year conducted an experimental and demonstration vineyard and orchard and also maintained a laboratory for scientific studies. We have arranged to station a man there during the coming year to aid in the solution of some problems of the growers of grape, peach and other fruits in this State.

PUBLICATIONS.

Our publications have consisted of twelve regular numbers of the Monthly Bulletin of the Division of Zoology, and a regular Annual Report. The Quarterly Bulletin was dropped over a year ago, although we yet have many requests for it. Our mailing list has grown since June 1st at the rate of fourteen thousand per year. Early in the year we revised the mailing list in order to reduce it, and found it possible to throw out about four thousand names of persons who did not return their special applications to be kept on the list. (Since then it has again grown from twenty-six thousand to forty thousand, which it contains at present.) The Bulletins were sent only to persons who requested them, and there are unmistakable evidences that this is the most important means of aiding the public in preserving valuable property in this State from destruction by insects and plant diseases. These Bulletins are used not only by farmers and fruit growers, but by agricultural and horticultural organizations, nature study clubs, and teachers in schools. In many cases they have been requested as aids in school work, and appear to have a distinct field of usefulness and a practical and educational value. We have taken great pains to have them accurate and reliable in every regard, and while the burden of their preparation has been great, indeed, we have the conviction that the public appreciates what we have accomplished for them.

The chief subjects of the Bulletins (Volume V) issued last year were as follows:

Number 1, May, Formulæ and Insect Pests.

Number 2, June, Formulæ and Insect Pests—Concluded; Potato Blight.

Number 3, July, Homoptera: The Study of Economic and Systematic Entomology.

Number 4, August, Nursery and Orchard Inspection; Directions in Economic Entomology.

Number 5, September, How to Make Insect Collections.

Number 6, October, The San José Scale.

Number 7, November, Scale Insects: Part IV of "A General Systematic Study of Insects."

Number 8, December, The Lizards of Pennsylvania.

Number 9, January, The San José Scale: Orchard Demonstrations; Nursery Inspection and Tree Dealers.

Number 10, February, Bird Preservation.

Number 11, March, Spraying; Report of Entomologist.

Number 12, April, Insects and Their Work; Insecticides; Index to Volume V.

Our May and June numbers give detailed formulæ for insect pests and have been requested to such an extent that the edition of forty thousand was practically exhausted at once. The September number on Methods of Making an Insect Collection and Preserving and Sending Insects was found so useful to teachers of schools that the entire edition was exhausted at once. The call for the October number on the San José Scale was so great that the supply was soon exhausted and it was found necessary to repeat the chief features of the directions in the January and March Bulletins. The July and November numbers were the third and fourth, respectively, in our series on "The General Systematic Study of the Insects of Pennsylvania," considered in the order of their systematic classification, with special reference to food, economic features and remedies. These are to be continued until all Orders of insects are discussed. We have had many calls for these from other states and countries. The December number, on "The Lizards of Pennsylvania," is unique in discussing in detail the food and economic features of our native lizards, which is a subject that has never before been given careful consideration by any investigator or author.

The February number on "Bird Preservation" was much appreciated and sought, and fortunately has been followed by many persons in the construction of bird houses and planting certain kinds of shrubs and trees to give food for the birds. The April number described practically all the common insects of this State under the classification of the plant or property which they infest, and this number has been pronounced by the press of this State, as well as by practical horticulturists and farmers, as the most valuable of the entire series of Bulletins that have yet been issued from this office.

Our time is fully taken up with a most extensive correspondence, averaging from forty to fifty letters per day, besides the printed literature of more than one page of new matter each day, and we consequently have no time for the preparation of a more detailed Annual Report. Those who are interested are invited to come into the office to inspect the various rooms thoroughly, to see the method of receiving and filing reports and sending notifications, and of receiving, filing and indexing all communications and specimens, see the collection in its working and workable condition and learn for themselves that this office is not a sinecure but an opportunity for a willing person to render an immense amount of important and needed public service in saving the crops or other property of this State from an annual loss which the United States authorities have justly estimated at not less than thirty million dollars. That we have succeeded in a goodly measure in this work is manifest by the many new orchards, and the increased study of insects, birds and other creatures in rural or farm life.

I take this opportunity to express my appreciation of the generally faithful and efficient co-operation of the field inspectors who have been assigned to their various stations, and of the investigators and office assistants who have worked with me in a most harmonious manner during the year, giving a greater number of hours of service per week than is generally given to public service, and earnestly co-operating in sustaining the work of the office. To my most faithful, competent, conscientious and earnest Assistant Economic Zoologist, Mr. A. F. Satterthwait, of Chester county, is due much credit for faithful performance of services, thus relieving me of what has previously been a load of details. I further desire to express my appreciation of the uniform support and encouragement given by the Secretary of Agriculture, the Governor, the Legislature and my fellow-officers in every capacity.

Respectfully,

H. A. SURFACE,

Economic Zoologist.

REPORT OF THE FRUIT GROWERS ASSOCIATION OF ADAMS COUNTY.

Flora Dale, Pa., January 1, 1908.

The Hon. N. B. Critchfield,

My Dear Sir: In accordance with agreement made with you less than a year ago, this Association undertook to secure information from its members relative to their orchard work with special reference to their spraying experience, the expectation being that we would be able, in that way, to obtain data which might be of interest and value to other orchardists into whose hands this report may fall.

As early as possible, forms were prepared and duplicate copies placed in the hands of each member. Unfortunately, owing to press of other work in hands of State Printer, these forms were not available until quite a little of the Spring spraying had been completed, thus materially affecting the volume of reports available for this synopsis.

The forms submitted to members, requested information as to size and character of the orchard; what particular insect pest or disease the spraying was intended to combat; what kind of material and apparatus was used; what quantity of material was required to treat trees of various ages, with cost of making and applying same, the latter question to cover both labor and material.

We take pleasure in handing you herewith the reports received, covering the season of 1907. You will notice in each case the brand of material used and the specific name of apparatus employed is given, but that we omit consideration of this special information in our combined report.

SAN JOSE SCALE SPRAYING.

MATERIALS.

A survey of the reports shows that as a remedy for San José Scale on apple trees, 7 per cent. of the growers used Lime-Sulphur wash, only 21½ per cent. used miscible oil in early winter and L.-S. wash in the Spring and 71½ per cent. used the oil only. On peach, 29 per cent. used Lime-Sulphur wash only, 14 per cent. used oil in Fall and Lime-Sulphur wash in the Spring and 57 per cent. used the oil only. Of the two reports on plum, one used oil in Fall and Lime-Sulphur wash in Spring and the other oil only.

EFFECT ON BARK AND FRUIT BUDS.

No deleterious effect reported from any kind of spraying, except one orchardist mentions slight roughening of bark where oil had been used on peach. One grower reports an improvement in peach bark where Lime-Sulphur wash was used.

EFFECT ON THE SCALE.

We are sorry that more specific replies were not made to this question, although we realize that in reporting on spraying, which is rarely, if ever, absolutely perfect, it is very difficult to arrive at definite percentages. It is a question whether the man who can keep his trees healthy and vigorous and harvest his fruit in a marketable condition, is not approaching as nearly to the limit of commercial possibilities as he may reasonably expect. Those who have made any mention of results seem to feel that they are holding the pest in subjection. The feeling of discouragement which resulted in quite a few trees being taken out three or four years ago seems to be replaced with confidence in the ability to master the situation, the best evidence of which is the renewed interest in the setting of young trees, and we now regard scale spraying as a legitimate part of our cultural routine.

It is of course, our hope that the old couplet,

"Big bugs have little bugs upon their backs to bite 'em
And little bugs have lesser bugs and so on ad infinitum,"

may in time help us with a parasite as has happened with the potato bugs. This will almost certainly occur eventually, but in the meantime, it is our duty to keep our orchards thrifty, or when the help does come we will derive no benefit therefrom.

COST OF SCALE SPRAYING.

PREPARING MATERIAL.

An average of reports as to cost shows that the expense of making 100 gallons of spray material, using a boiled 22-17-50 formulae for the Lime-Sulphur wash and a 1 to 20 proportion for the miscible oil washes, is as follows:

	Labor.	Materials.	Totals.
Lime-sulphur Wash,	$.45	$.93	*$1.38
Oils,	.15	2.62	2.77

*No charge for fuel or cooker included.

APPLYING.

As there seems to be some variation in expense depending upon character of apparatus used, we have worked out the following averages from the reports:

	Barrel Pumps.	Power Outfit.
Cost of applying 100 gals.,	$1.37	$.55
Cost of applying 100 gals. (average of above),		$.95

AVERAGE TOTAL COST OF MAKING AND APPLYING 100 GALLONS.

	Labor.	Materials.	Totals.
Power outfit and L-S Wash,	$.75	$1.04	$1.79
Hand pump,	2.05	.88	2.93
Average cost L-S Wash,	1.40	.96	2.36
Power outfit and Oil Wash,	.75	2.80	3.55
Hand pump and Oil Wash,	1.53	2.50	4.03
Average cost of Oil Wash,	1.14	2.65	3.79
Average both materials,	1.27	1.805	3.075

TREES COVERED.

An average of the returns seems to indicate that 100 gallons should cover about 180 trees five years old, 70 ten years old and 25 fifteen years old. Combining the above averages of cost and number of trees covered per 100 gallons we have an approximate cost of $.017 each for young trees, $.044 each for five years and $1.25 for those fifteen years old. These values must be regarded as approximate only for the reason that some men by lack of care use much more material than is needed, while others do not use as much as they should in order to do a good job. One report which we know to have been carefully worked out, shows a cost of $0.16 for five-year old apple, $.10 for those ten years old and $.25 for those forty years old.

CODLING MOTH SPRAYING.

In spraying for codling moth, 16 per cent. of the reports used Paris Green and 84 per cent. used Arsenate of Lead as a poison base. Eight per cent. used home-made Bordeaux with Paris Green, the same percentage used home-made Bordeaux with Arsenate of Lead. Of the 84 per cent. using Arsenate of Lead, 61 per cent. used a commercial preparation which is a combination of Arsenate of Lead and Bordeaux and comes in paste form all ready for use.

The home-made Bordeaux-Paris Green mixture was made by adding ½ pound of Paris Green to 50 gallons of 4-6-50 Bordeaux. The home-made Bordeaux and Arsenate of Lead was made by adding one pound of Arsenate of Lead to 100 gallons of 4-6-50 Bordeaux. The commercial combination of Arsenate of Lead and Bordeaux in paste form was used at the rate of 16 pounds to 100 gallons of water.

COST OF 100 GALLONS DILUTE SPRAY.

MATERIALS.

	Labor.	Materials.	Totals.
Paris Green and Bordeaux,	$.22	$1.12	$1.34
Arsenate of Lead,	.06	.72	.78
Commercial Arsenate of Lead-Bord.,	.12	2.28	2.40
Average cost of above,	.13	1.37	1.50

COST OF MAKING AND APPLYING 100 GALLONS.

	Labor.	Materials.	Totals.
Paris Green-Bordeaux,	$.64	$1.12	$1.77
Arsenate of Lead,	.67	.69	1.36
Commercial Arsenate of Lead-Bord.,	.69	2.28	2.97
Average,	.66	1.36	2.02

RESULTS.

The results of spraying for codling moth were very satisfactory where trees were sprayed well, twice, some reports claiming less than a half per cent. of wormy fruit. One report mentions the marked difference on opposite sides of the same trees, one side having been sprayed and the other omitted. Where Bordeaux was present in the spray mixture there was a very noticeable improvement in the foliage.

The per tree cost of doing this codling moth spraying seems to be about 8 cents for trees fifteen years old and 10 to 12 cents for older trees of moderate size, running up to 15 to 20 cents for very large trees, these amounts being for one application. There should always be two good applications; one just after the petals fall and the other two to three weeks later followed by a third in case there is much fungus on fruit or foliage. Our experience has shown Arsenate of Lead to be vastly more satisfactory than Paris Green as a protection against chewing insects. It seems to be absolutely harmless to the most tender foliage, adheres to leaves during entire season and kills any insect that eats it. The commercial combination of Arsenate of Lead and Bordeaux paste, mentioned above, seems to be much in favor here wherever there is any fungus trouble of foliage or fruit to combat.

Viewing the subject of spraying from a general standpoint, we think we have reason to feel that we are on the right track. Fruit exhibited by this Association at the last two annual sessions of the State Horticultural Association, has been granted the highest award for excellence each time. We believe no higher price was paid in this State last Fall at picking time for the varieties we grow than was given for Adams county fruit. Quite a little of it was shipped for direct export.

As an encouragement to other fruit sections of the State, it may not be amiss to add that our shipments have increased three-fold in four years and our cash returns more than four-fold in the same time. Fifteen orchards from which we obtained detailed reports for season of 1907, (210 acres in the aggregate) yielded an average cash return of $180.00 per acre. None of these orchards yielded less than $120.00 per acre. Twelve of them returned over $150.00 per acre, ten over $200.00 per acre, eight over $300.00 per acre, five over $400.00, three over $500.00, two over $700.00 and one $740.00 per acre. These returns are almost all from York Imperial apples, which is not considered as top notch in the matter of price per barrel. We are also finding potatoes a very profitable crop in connection with orchards and believe it is the best one to use with the view of securing the most satisfactory and economical growth of a young orchard to bearing age.

Trusting that this compilation may be of use to you and through you, to other fruit growers in the State, and assuring you of our appreciation of the kindly interest you are taking in the fruit interests of this Commonwealth, which we believe will in a few years rival those of any other State in the Union, we are

Very truly yours,

FRUIT GROWERS ASSOCIATION OF ADAMS COUNTY,

EDWIN C. TYSON,
Cor. Sec.

PAPERS READ AND ADDRESSES DELIVERED AT THE ANNUAL MEETING OF THE FARMERS NORMAL INSTITUTE, HELD AT ALLENTOWN, PENNSYLVANIA, JUNE, 4-7, 1907.

THE WASTE AND SAVING OF THE WATER IN THE SOIL.

BY MR. H. R. HILTON, *Port Allegany, Pa.*

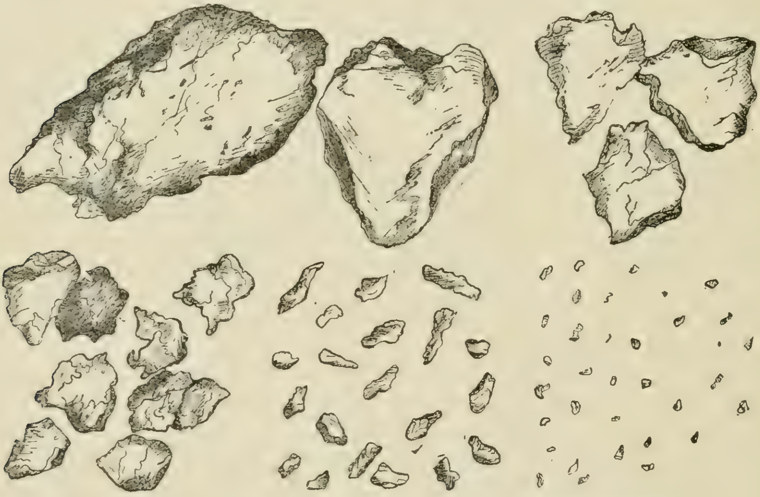
After listening to the addresses of welcome that have preceded mine, I feel a little nervous in coming before you to tell my story in my awkward way. Mr. Seeds did not have any difficulty in convincing you that he is an Irishman; you have his own word for it, and then you have his wit. Now, I think I have just as good evidence that I also am an Irishman, and that is my brogue. I trust I may be able to make you understand me tonight in spite of it.

The State of Wisconsin has worked out the total amount of water required by the various crops that are grown on a farm, and find, for instance, that corn requires about three hundred pounds of water to one pound of dry matter; oats, five hundred and twenty, and clover, four hundred and fifty. Corn, according to this formula, requires three hundred pounds of water to produce one pound of dry matter.

The record of the weather bureau at Harrisburg for the past nineteen years averages thirty-seven inches per year, and eighteen inches for the five growing months, April to August. It is now generally conceded that one-half of the rainfall can be utilized by the growing crops, and one-half is wasted by evaporation, run off during excessive showers and by drainage beyond the reach of plant roots. We can always depend on four inches of water being held in the top three feet of soil and available for plants on the first of April in every year. Add to this one-half the rainfall of the five growing months, viz., nine inches, and we have thirteen inches of water available each average year to develop plant growth.

The average yield of corn in Pennsylvania is estimated at thirty-two bushels per acre. This, on the basis of the Wisconsin formula, would require about five inches of water to produce, and would mean that less than one-third of the summer rainfall had been utilized. If one-half the summer rainfall and one-half that in store April first had been used by the growing corn, there would have been water enough available to make the average corn crop yield seventy bushels per acre. This reveals a wide margin for improvement, and points out where additional food supplies may be obtained for the 85,000,000 mouths to be fed in the United States, without any increase of acreage, and it is this enormous waste of a very valuable resource of every farm that I am here to discuss with you this evening.

When we build a house we first get an architect's plan, select a site, and then assemble brick and stone, sand and lime, lumber and lath, and whatever more may be called for by the specifications. The next step is to assemble the workmen, and each trade represented must co-operate and work in harmony, if the building is to be erected expeditiously and economically. If one class of workmen is absent, others are delayed, and the building cannot be completed until each does his part. It is just so in plant building. We need to study the plans of the great architect of Nature, and see that there is assembled in the soil all the materials the plans call for; the nitrogen, the potash, the phosphorus, the lime, and all the minor chemical elements that go to make up a fertile soil. But these in themselves cannot build the plant. The four master workmen, water, air, temperature and light, must all co-operate and work in harmony if the plant is to reach a perfect growth.



Clay.
1-5000th to 1-25000th in.

Fine Silt.
1-2500th to 1-5000th in.

Silt.
1-500th to 1-2500th in.

Very Fine Sand.
1-250th to 1-500th in.

Fine Sand.
1-100th to 1-250th in.

Medium Sand.
1-50th to 1-100th in.

Fig. 1.

All of these are important, but it is mainly about the work of the water in the soil that we are to consider now. The soil, as you know, is simply rock of varying sizes, from one-twenty-five-thousandth of an inch in diameter to one-fiftieth of an inch, or from the size of the finest clay particle to that of medium sand. Figure 1 shows the comparative sizes and classification made by the Department of Soils, United States Department of Agriculture, magnified 325 times. One particle of medium sand is equal in bulk to 6,000,000 of the finest clay particles, and the amount of surface on these 6,000,000 clay particles is 300 times greater than that on one particle of medium sand. As the water in the soil spreads itself in a thin film over the surfaces of all the soil grains, the amount of surface in a given bulk of soil is important.

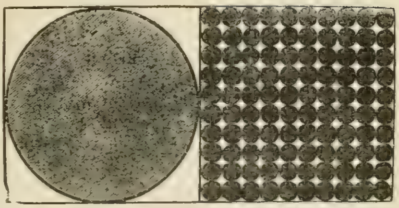


Figure 2.

Figure 2, suggested by the illustration of Professor King, of the Wisconsin Experiment Station, is given in abbreviated form, to show how reducing the size increases the area of surface in a given quantity of soil. A marble one inch in diameter that will slip inside of a cubic inch box presents 3.1416 square inches of surface; reduce the size of a marble to one-tenth of an inch in diameter, and then 1000 of them will be required to fill the same box. The surfaces of these 1000 marbles will be 31.416 square inches. Reduce the marbles again to one-hundredth of an inch in diameter, and 1,000,000 marbles will be needed; and reduce to one-thousandth of an inch in diameter, 1,000,000,000 will be required to fill the cubic inch box, the surface of which, if spread out flat, would equal 31,416 square inches, or in a cubic foot 37,700 square feet, or seven-eighths of an acre! In a soil with grains one-thousandth of an inch in diameter (this would be the equivalent of a medium silt) there will be nearly three and one-half acres of exposed surface in a section one foot square and four feet deep. A very thin film of moisture spread over this extent of surface provides a large quantity of water within the reach of plant roots.

Clay soils divide up very much finer than this, yet a finer divison into separate grains is not desirable under field conditions. A much closer arrangement of the soil grains that we find in fine silt would retard the circulation of the air and the movement of the surplus rain water down into the subsoil. The soil must be kept just porous enough to take in all the rain as it falls, and store it for the future as well as the present use. Too fine a division may make the soil impervious to water, and cause surface washing, always a serious loss. The 1000 spheres in the cube in Figure 2 occupy 52.36 per cent. of the entire space in the box; the volume of the empty air spaces between is 47.64 per cent. If the diameter of these spheres is reduced to one-tenth, the number will be increased to one million, and, arranged in the same way, they will just fill the cubic inch box. But the space in the box occupied by the million spheres will be just the same, and the volume of the empty space between will remain unchanged. We can change the volume of space, however, by changing the arrangement of the spheres to the pyramid form, which packs them more closely together and reduces the volume of space to 26.95 per cent. The variation in the volume of space in dry soils is from 25 to 75 per cent., according to whether it is very sandy, or a rich loam, or peaty soil. In the great mass of tillable land in a friable condition, the range is from 40 to 60 per cent. and the average about 50 per cent., i. e., the soil occupies about half the space in a cubic foot box, the air filling the remaining half. The amount of space in any soil is increased or decreased, according to its physical condition or degree of moistness at the time of cultivation, and the method of tillage employed. If the soil is quite moist when stirred, so that particles stick together, then the space is increased; but if dry the particles will settle closer together and the space be decreased.

It will, of course, be understood that the soil grains take no such orderly arrangement, one resting above another, or one between two other, as do marbles packed in open or close form. Their great variation in shape, weight and size; their extreme lightness, and their tendency to adhere to one another when moist, precludes order in their arrangement. But in all soils having a greater diameter than clay or fine silt, the object most to be desired is a uniform arrangement of the soil particles, thus securing the highest number of contacts between them, giving the conditions most favorable to obtain a high-water content.

WATER IN THE SOIL.

When the rain falls more rapidly than drainage, either natural or artificial, can remove it, and the water fills all the spaces between the soil grains, it is called "gravitation water," and in this condition the soil is fully saturated. While this condition exists, the water moves in one direction only, downward, acting under one force, gravity. The rate of flow is fast or slow, just as the soil particles are coarse or fine, and the spaces between great or small. In other words, friction and outlet below control the speed. When a cubic foot of average soil having 50 per cent. of air space is fully saturated, it contains half a cubic foot of water, or 31.25 pounds, or 3.75 gallons, or 50 per cent. by volume. Gravity will remove half of this quantity of water. Capillary attraction, or surface tension, as it is better called, will hold back one-half, which is spread in a thin film over the exposed surfaces of the soil grains. When the water carried down by gravity descends beyond the reach of plant roots or escapes in drain tiles, it has passed beyond the control of the farmer, but the water held back by surface tension is largely within his control, and the quantity he will utilize is measured by the means used to prevent its escape except through the leaves of the growing crop.

Figure 3 with proportion of soil grain to water film exaggerated, shows how the water films surround the soil grains and thicken at the points of contact. This naturally suggests that the more the compacted soil is pulverized and the particles separated so that they will rest loosely and uniformly together with many points of contact around which the water films may thicken, then the more water such a well cultivated soil will hold back from drainage.

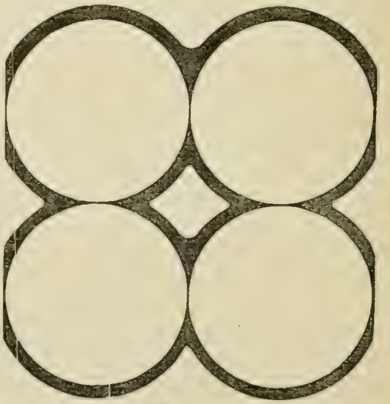


Fig. 3.

CAPILLARY RISE.

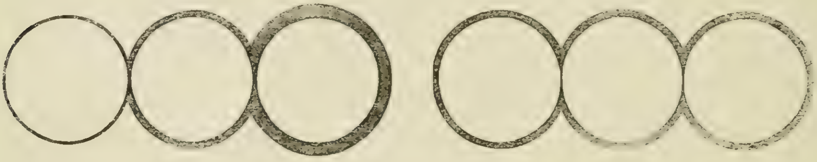
A glass tube one-tenth inch in diameter will lift a certain weight of water over one-half an inch (5.45) above the level of the water in which the end of the tube rests. A tube one-hundredth of an inch in diameter will lift the same weight of water nearly five and a half

(5.45) inches, and a tube one-thousandth of an inch in diameter will lift it over fifty-four (54.56) inches. If there are any subsoils that maintain a ground water level (full saturation) within four feet of the surface, then capillary water would rise from this water level into the soil above to a height that will be proportioned to the fineness of the soil particles, and if so fine that the spaces between will be at all points not less than one-thousandth of an inch in diameter, then the water will rise into the soil above this ground water level fifty-four inches, or within six inches of the surface. As this degree of fineness rarely exists at all points under natural conditions, the capillary rise is more frequently within the limit of one or two feet. This would bring the capillary water within two or three feet of the surface. Where the surface soil holds water in excess, and requires drainage, to remove the surplus and fit the supply to the needs of plant life, then the height to which capillary water will rise may become important in determining the depth at which to place tile drains. For instance, if the subsoil is of sufficiently fine texture to lift the capillary water three feet, then a tile laid at the depth of four feet would lower the ground water to that level, and the capillary water would come to within one foot of the surface, furnishing a fixed supply of moisture to the deeper roots of growing vegetation, so long as that ground water level was maintained. If, however, the subsoil is of a texture that could lift water but two feet, then the tile drain should be placed at the depth of three feet to bring the capillary water equally near the surface. But this condition can apply to a very limited area. The more prevalent condition after June first is a ground water level so deep that the capillary rise from it can never benefit the deepest rooting trees or plants. Our surplus water disposes itself by simply thickening the films to half saturation, as far down in the soil as the supply will go.

SURFACE TENSION.

The majority of farmers are now familiar with the capillary rise of water from ground water level, but the movement of the water when the soil is less than half saturated, and no ground water level within available distance, is less understood, but most important to understand, because it is the only water available to the plant, the water most easily lost and most under control of the tiller of the soil.

I hold in my hand a rubber band. I stretch one-half to its fullest limit. You will notice that the farther the rubber is stretched, the thinner it gets, and the tighter it grips over my thumb. The other half of the rubber is of normal thickness, and presses lightly against the finger. By holding my hands the same distance apart and freeing the center of the band, you will notice that the tension has been distributed equally at all points, and the band is of equal thickness at all points. This does not illustrate the principle that moves the water over the surfaces of the soil grains, but it does illustrate the method. When the film water is thinnest it is held with the greatest force against the exposed surfaces, and where thickest, it is held with least force. The greater tension of the thinnest film is all the time drawing water from the films that are thicker in an effort to adjust the differences between them and make the tension equal at all points. In other words, when the soil is less than half saturated, the movement of the film water may be in any direction, up, down, or laterally, but always from the point in the soil where the films are thickest to the points where it is thinnest. This movement is most free and rapid when the soil is nearest half saturation, or in the average soil when it contains three inches of water to one foot in depth of soil, and the movement practically ceases when the water content has been reduced to quarter saturation, or one and one-half inches per foot of depth, so that while there may be three inches of water left in every foot depth of soil after drainage has carried off the surplus of the shower, if any, there is never more than one and one-half inches of water available to stimulate plant growth. This would equal about two gallons of water to each cubic foot of soil.



"a." "b."

Fig. 4.

The three spheres at "a" in Figure 4 represent three soil particles, surrounded by thick, medium and thin films of water. The greater tension or strain of the thin films pulls from the medium, and the medium pulls from the thick one till the total amount of water is equally distributed between all three soil particles, as shown at "b" in the same diagram.

HOW THE RAIN GETS IN.

When the supply of water in the soil is reduced to quarter saturation, its movement practically ceases. In a soil capable of retaining three inches of capillary water in each foot of depth, it is the third inch that sets in motion all the energies and activities in the soil that feed and force plant growth. When the water content is reduced to one and one-half inches per foot, plants may live, but vigorous, profitable growth is checked.

When the rain falls on a dry soil that has been pulverized to a fine state of division the tendency is to fully saturate as it goes. It descends like the rain drops on the window pane, leaving a film spread over all the soil particles it passes, but with a bead at the end. Its motion is slower, because it has more friction to overcome. If the rainfall is excessive, there will be a tendency to puddle in fine texture soils and make a mud blanket, that causes some of the rain water to flow off on the surface, because the soil cannot take it in fast enough. The mud blanket also imprisons the air underneath, and this captured air resists the further descent of the water. But when the falling rain comes in contact with moist soil, new forces are in operation. The water films in the moist soil that are the first to feel the contact with the rainwater become thickened. Those directly under having thinner films and greater tension, commence pulling from or robbing their thicker skinned neighbors, to be in turn robbed by the neighbor next below. In this way surface tension aids gravity in removing the water from the surface into the soil, and much more rapidly than where the soil in the same mechanical condition is free from moisture. It is the difference between the rate at which the first rain drop trickles down the dry glass, and the next one that follows in the moistened track. For this reason a moist soil gets much more of a shower that gives less than an inch of rain than does a dry soil, because it moves a much higher precentage of it away from the influence of the sun and wind.

HOW THE WATER IS LOST.

This will also explain how the water is so easily lost from the soil by evaporation. When the surplus rainwater is removed and drainage has ceased, then the operation is reversed. The sun, wind and dry air promptly attack the water films on the surface soil grains, reducing their thickness. The surface films give to the air, and take from the films below to make good the loss. In a short time there is a continuous stream from a depth of possibly two feet to the surface to make good the continual loss at that point. This upward movement is most rapid when the films are thickest and most elastic, and grows less as the films grow thinner, and are held with greater force against the soil surface. The manner in which this loss occurs suggests the remedy or preventive. Change the moisture line from the surface of the ground to a point two inches or more below the surface. Do this by stirring the top soil so as to loosen and dry it out. This enlarges the capillary spaces and breaks the films. Water cannot rise from a half-saturated soil into a dry soil. Two and two and a half inches of dry soil is a very effective mulch, as good as dry straw, but needs renewing after every shower. Keep the surface soil dry. This is the lid to the soil cistern, and the stopper to the soil water bottle.

LOSSES BY EVAPORATION.

During June, July and August, the greatest loss of water from the soil is by evaporation during the first four days after the rain has ceased falling. The run-off water and that carried off by subsurface drainage may seem larger to us, because we can see it, but it is insignificant as compared with the amount of water absorbed by the air. After the fourth dry day the surface of the unshaded soil will have crusted or dried out sufficiently to greatly reduce the upward flow of water, and the interlacing roots will intercept what is left. It is immediately after the shower ceases that the heaviest loss occurs, and it is the promptness with which we stir the exposed soil after heavy showers, or the amount of humus in the soil to enable it to dry out on the surface without crusting or baking, that determines how much of the rainfall we lose, or how much we save for use by the growing crops.

TILLAGE.

We plow, harrow, roll and cultivate that we may separate the particles that have been compacted by the frequent rains during the year, and rearrange them loosely, but with as many points of contact as possible, just like meal in a barrel. Cavities are waste places in the soil, and should be removed by cultivator, disc or roller. If we arrange oranges in a box, placing each one on top of the other, each with four points of contact, they will occupy 52 per cent. of the space. But if we slip them in between one another, in alternate rows, we have six points of contact for each orange, and gain over 10 per cent. of space in the box. (See Figures 5 and 6).

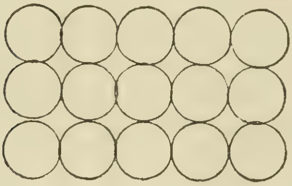


Fig. 5.

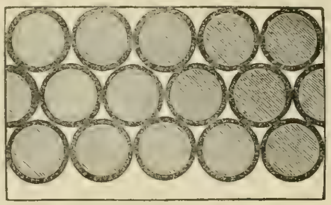


Fig. 6.

The more uniform the soil grains can be arranged, giving most points of contact, the more water can be held back from drainage and stored in the tilled soil for the use of the plants. The greater the depth of tillage, the greater the water supply near the root zone, but the land should not be plowed deeper than it can be thoroughly worked, and should be deepened by degrees, making no marked change in any one year. It will take about two inches of dry soil earth to form a satisfactory dry earth mulch to protect the soil moisture on the mountain farms, and two and one-half inches for the lowlands and the southern part of the State. If the land is plowed six inches deep there only remains three and one-half inches of stirred soil in which the finer roots can develop and grow. If the land is plowed eight inches, then the root zone is increased to five and one-half inches, or an increase of 36 per cent. of new feeding ground for the plant roots. This is just like taking a ten-acre pasture that will carry seven cows, and by fertilizing it, making it produce enough more grass to carry ten cows equally well. It is another way of increasing the size of the farm by adding two inches to the bottom instead of buying 36 per cent. more land to add to the side, and putting the same amount of labor one one hundred acres that would be put on the one hundred and thirty-six acres.

The study of this question suggests that in the preparation of the seed bed, the finest soil should be worked into the lower half of the depth stirred, where the roots grow thickest, and the coarse soil, clods and trash should be worked to the surface to break the force of the heavy rain drops, and partially prevent packing and puddling of the surface soil. This suggests further the fining of the surface soil with disc or harrow before plowing and turning this fined soil into the bottom of the furrow. After plowing, the tool used should pack the under surface to remove the cavities left by the plow. It should press downward. The roller may be used to break clods, but never to finish with. Rolled land should be harrowed at once to sift the fine soil down and lift the coarse soil up. A spring tooth is good for this.

The objects of tillage are: First, to increase the water-holding power of the soil, so that more will run in and less will run off or drain out. Second, to admit air freely to all parts of the soil, so that the bacteria of the soil may develop and thrive, and carry on the work of tearing down the organic matter, and prepare it for food for the plant, and to facilitate the dissolving of the mineral elements. Third, to make it easier for the fibrous rootlets to thread their way through the soil and get in contact with the water films in which the food is held in solution. Fourth, to prevent growth of weeds and loss of moisture after heavy rains by prompt tillage, two to two and a half inches deep.

The poorer a soil is in vegetable matter or humus, the less water it will hold, and the quicker it will lose what it does retain.

The adding of manure, and especially the turning under of catch crops (legumes preferred) will increase the water-holding power, and it will suffer much less loss by evaporation, because the top inch will dry out without crusting or baking, forming a partial dry earth mulch. The richer soil is more drouth resistant, and suffers less from lack of tillage, when prompt tillage cannot be given.

LIMING THE SOIL.

Figure 7 is a reproduction of the clay particles floating in a drop of water, showing how they repel one another and keep separate. Figure 8 shows the same sample, with a little lime water added. Note how the lime acts on the clay particles to draw them together in clusters, so that each little mass acts toward water and air together as one soil grain. This flocculation by the action of lime gives clay soils a more porous and loamy character, and points out one way in which lime benefits the soil physically, if used in moderation, and in the presence of organic matter.

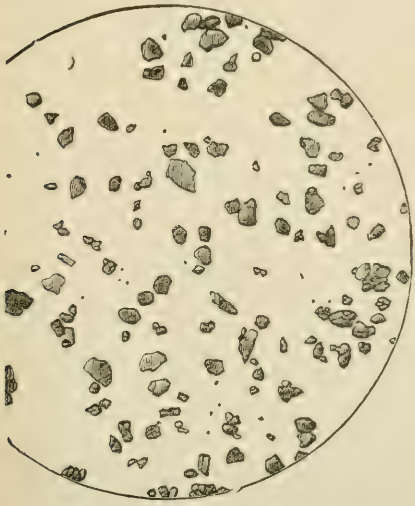


Fig. 7.

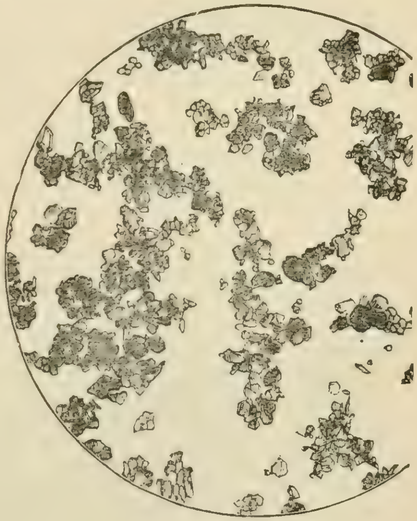


Fig. 8.

Figure 9 is another illustration of the flocculating effect of lime on fine soils. Its chemical effect in sweetening sour lands is already well known to the farmers of the State, and it has other chemical effects already published by the State College in official bulletins.

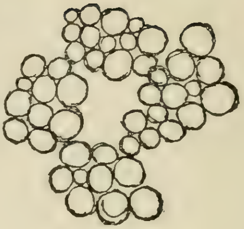


Fig. 9.

DRAINAGE.

The value of tile drains is to remove the surface or gravity water from the surface two or three feet, so that air may freely penetrate where the soil has a tendency to form a ground water level near than three feet to the surface. It has a further use in letting the trapped air escape when the rain falls faster than the films can remove it down into the soil by simply thickening it. When the spaces are water-logged for two or three inches, the trapped air is compressed, and this compressed air hinders the gravity flow into the subsoil, and forces washing at the surface. If, however, there are drain tiles, the compressed air is forced into these, and the water follows, thus relieving the surface clogging and lessening the surface washing.

In presenting this subject, you have discovered that I offer no easier way to get a certain amount of product from the soil. The product is more the result of so much labor, rather than the yield of so many bushels per acre. We need a new way of expressing the results obtained, which should be so many bushels or pounds per unit of energy, intelligently exerted, rather than so much per acre. One of our oldest axioms is still one of our newest, that "Man must earn his bread by the sweat of his brow."

NATURAL AGENCIES IN SOIL IMPROVEMENT.

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The question of soil fertility is one of the first importance. It measures in large degree the size and quality of the crops that grow. Seasons may change, climates may be different, but in any case fertility is the one thing that more than any other controls the harvest. It is but natural, therefore, with the growing knowlegde that we have of the soil in its various phases, that its study should occupy our minds more completely than any other one subject connected with farming. Other lines of investigation contributory to the uplift of farming have their best application only when fertility is the basis. It is quite natural, too, that until we understand the soil more fully that the methods of practice adopted are not such as to contribute to the upbuilding of the soil, but rather to its depletion. This has been the history of all countries, and is the history of our country as well. Until within quite recent times, our knowledge of the soil did not permit us to give advice to farmers that would enable them to conserve or build up their fertility, because we did not know surely what was involved, and even now we are but on the threshold of the knowledge that lies before.

As an introduction to my subject, I desire first to present some general considerations concerning what may be termed constructive and destructive natural forces. The natural forces of sun, air, water and temperature, and the principles upon which the science of geology, of chemistry, of botany, of biology, and of physics are based, are all concerned in the proper development of the farm, and the true progress of the farmer, and have existed since the beginning of time. Because these are facts, the methods of farming in vogue from the earliest times to the present, and the methods of today, have exerted, and still exert, an influence upon the development, progress and happiness of all the people upon all the earth.

Since the solid portion of the earth first appeared these forces and others, seen and unseen, known and unknown, have been constantly at work changing the character of its surface. These forces have wrought by day and by night, in summer and in winter, in sunshine and storm, but always and incessantly, and, as a result of their action, there appeared upon the hard and rocky surface, first, the humble lichen, then the more haughty gorse or furze, which, in their way, became forces, too, and assisted these mighty unseen workers, until, in their task of world-building, the former rocky surface of the earth, whether the mountain or valley, whether the prairie or desert of today, became covered with the various forms of vegetable life, each drawing its sustenance from the mineral and organic matters, more or less broken down or decomposed, that we call soil. This soil, which we now work, and which, if left to nature again, would not produce crops that the farmer regards as largely useful, with the possible exception of timber, yet a more detailed study of the action of these natural forces when not directed will, I think, give us some clue as to their value when controlled and directed by human intelligence, wherever there is the purpose to derive from such soil sustenance for man and beast.

The tendency of our cultivated fields, if left to nature's way, would be to cover them with growths of various sorts, and gradually there would be accumulated substances that would provide more favorable conditions for the growth and development of cultivated plants. That is, the continuous occupation of the soil by growing plants would, in the first place, hold the particles of soil together and prevent their movement by mechanical means, and in the second place, the growth of the plants themselves would cause a breaking up of hard and insoluble substances of that soil, making them available to plants, and the organic matter accumulated and mixed with the mineral substance would make the soils more absorptive, and would prevent the rapid washing away of the soluble constituents. Besides, because of its greater absorptive power, floods, drouths and consequent barrenness and sterility would be largely prevented.

Or, in other words, nature teaches us that if we are to conserve and improve the fertility of our soils, we must keep them occupied, thus holding them together and preventing the losses that are liable to occur through the far-reaching removal of their constituents by man's suppression of the natural growths. Nature's way results not only in the conservation of soil, in the retention of that which is liable to be lost, but in the improvement of its character, both physical and chemical. Nature is constructive, not destructive; her tendency is constantly towards accumulation. The magnificent forests, which formerly occupied large areas of our country, and which still exist in a limited way; the broad prairies, stored with the residues representing the continuous growth of centuries, give abundant evidence of this constructive characteristic, and this wealth of forest, and these storehouses of fertility, are due to the beneficent provisions of nature for man's use.

Let us see for a moment how man has used them. From the beginning of recorded history there has been a tendency, not merely to rob the soil of its inherent virtues, but to prevent nature, largely, at least, from contributing to its upbuilding. Many of those countries which, in the world's earlier history, were rich in fertility, and, in the words of the prophet, "flowed with milk and honey," are now barren wastes and deserts, and for no other reason than the lack of observation and the direction of the laws which are involved in the economical production of crops with the accompanying maintenance of fertility. In Roman times soil areas had been reduced to such a stage of exhaustion as to cause great anxiety on the part of the Emperors, and in the first and second centuries of the Christian era efforts were made to protect the soils from exhaustion, and to increase the fertility by drainage, irrigation, rotation of crops and other means. In more recent times the German states, because of the exhaustion of their soils, particularly in the north, were facing the serious problem of food shortage, and were fortunately saved from starvation by the discovery, by Baron von Liebig, of the underlying principles involved in the growing of plants and in the improvement of soils. While certain of the German soils were naturally poor, there is no doubt but that the wasteful methods of treatment and the ravages of the nomadic hordes which overran the country in the Middle Ages were responsible for their further impoverishment. It is not necessary for us, however, to turn to ancient times for examples of farm methods which result in the rapid depletion of the soil's fertility and the loss of natural wealth. In all sections of our own country we note evidences of poor management in the treatment of our soils, and management which unfortunately has been encouraged, and is even now encouraged, by a too generous and improvident government in opening new territory, which, in part, relieves the farmer of the moral responsibility.

However, while nature's way is in some particulars quite the opposite of that which the farmer must follow in order that he may obtain value from his soil, a great difficulty has been encountered in the failure to recognize until recently that nature's ways may continue, and at the same time not interfere, but rather help the farmer in his work. Nature has been antagonized, because the principles underlying the production of crops and the conservation of the food in his soil has not been understood, and thus the history of farming in this country, as in all countries, is one of wastefulness in the utilization of natural resources. As already pointed out, nature added to the soil an abundance of vegetable matter, which, in its partial decay, contributes not only to the absorptive, water and food-holding capacity of the soil, but also to the building up of the crop. As the farmer began his work on soil cultivation, he created a tendency towards the reverse order of things, favoring not a legitimate use of the organic matter in the soil, but its burning up, as it were, and in consequence fertility was reduced and the yields became poorer.

Because of the abundance of land, the practice prevailed not of conservation and improvement by directing nature's laws, but of taking up more land, or of clearing it of timber, in order that more produce might be grown. The timber was not utilized as it might have been, since the primary purpose was to obtain the land upon which it grew. This system, which the individual farmer followed, which was practiced by farmers in the aggregate, has resulted in the destruction of our forests, or the wasteful management of our lands, has resulted in materially changing the climate of our country, but certainly the changed conditions of soil, in so far as they concern its water-holding capacity, are such as to considerably modify the effect of our spring and winter rains. The floods, which have recently been so devastating in their character in many parts of our country, and the periodical drouths, so destructive in their nature, are due, in great measure, at least, to the removal of our forests, and to the depletion of the organic matter in our soils, with the consequent rapid running away of the water, rather than its absorption and conservatism, and its gradual movement toward the sea. This destructive system of farming is not confined to any special district, though it is especially noticeable in those sections of our country where single crops are the farm's main source of income, as, for example, cotton and tobacco in the South, corn in the Middle West, and wheat in the Northwest. These systems of farming are very wasteful of soil fertility, because they do not provide for the building up of the soil, either in the organic matter or in its physical character. Even the ranges of the far Western states have been injured by destructive methods. The grasses have been destroyed, the water-holding capacity of the mountain sides decreased, and the available water for the irrigation of the drier plains below materially diminished. All of these methods, which have lessened the productivity of many of our soils, show but one side of the losses that are actually occurring; the side which is perhaps the least important, though it cannot be separated from the other, for the two combined must constitute what we understand by natural fertility. In other words, it has been shown that the final measure of fertility of a soil is its content of nitrogen, phosphoric acid and potash, and the elements contained in comparatively small amounts in soils and removed by crops in relatively large amounts. That is, we may have a soil quite perfect in its physical character, that would hold water and give it up gradually to the plant, that would hold warmth, and in other ways be perfectly capable of contributing to the growth of the plant, and yet be incapable of supporting plant life, if deprived of the constituent elements, nitrogen, phosphoric acid and potash, while in the presence of these, other things being equal, the growth of crops would be in proportion to their amounts that might be made available from year to year.

It is a fact—and facts are stubborn things, and cannot be gainsaid—that the capital stock of any country, and, therefore, its present and prospective wealth, lies in its natural resources. In an agricultural country these resources are in its soil, and since the value of the soil, or its sustained power to produce crops is measured by the content of nitrogen, phosphoric acid and potash, together with the condition which make them available to plants, it follows that this capital stock of fertility in our soils, these national resources are reduced in proportion as these elements are permanently removed from them. These, I repeat, are facts now clearly recognized, and it is upon them that the fertilizer industry in this and other countries is based, an industry, which, though in a sense only in its infancy, has already reached magnificent proportions, and will continue to grow in keeping with the needs for artificial plant food. Any system of farming must, however, result in a removal from the soil of the elements of fertility, yet there is a system which, if carried out, would result in a minimum rather than a maximum removal of those from the soil, and this system, which provides for the maintenance of the physical and chemical character of soils in other respects, may be regarded as constructive. There is not a farmer but can point out numerous examples of what may be termed "constructive" and "destructive," or good and poor farming, in these respects. On the one hand, we have the man who, under normal conditions, always gets good crops, whose fertile fields are always occupied, whose cattle are sleek and fat, and whose home is a center of happiness, culture and content; while on the other we have the man whose crops, while not always poor, are never good; whose fields, only partially occupied by plants, are furrowed and gullied by the winter and summer rains; whose lean cattle are lowing for food, and whose home is poorly provided for, and is the center of worry and discontent. The same natural forces are potent for good in each case; in the first they are directed and help to build up the farm, while in the other they are antagonized or neglected, and help to destroy.

I am well aware that these considerations are general, and have no specific application to the individual farmer; but with the general situation clearly outlined, it is possible for us to apply the principles to our own farms. In the first place, however, we must know something of the origin and formation of soils, for while soils vary in many respects, there are certain qualities which are common to all. That is, it makes no difference whether the original rock from which a soil is derived, was either of the three classes, sedimentary, metamorphic or eruptive. All soils, whether derived from limestone, sandstone, granite or trap, must possess certain characteristics, as fineness of division, measuring mechanical or physical properties, and must contain the mineral food elements, which plants need, and must be capable of having incorporated with them vegetable matter. These give to soils the qualities that measure fertility, namely, physical, chemical and biological, which make them valuable as a medium for the growth of plants, supplying them not only with the moisture they require at the time they require it, and providing conditions favorable for the changes that must take place in germination, growth and maturation, but also the chemical transformations that render inert plant food available for future crops.

It is with the improvement of these three phases of the soil that we must deal, if we are to build them up in a natural way. It is also true that soils derived from the same rock formation are not equally good, for even those of similar origin may vary widely in their quality, and more especially in their physical and chemical character; some are too open and porous, contain too much sand, become too hot and are poor in plant food; others are too heavy and compact, and while they contain an abundance of plant food. it is difficult for the plant roots to penetrate and absorb it. Others contain so little vegetable matter that there is no "life;" they become hard, and break up into clods and lumps, and if by reason of good tillage are made fine, they puddle with the first rain. These are deficiencies that are to be made good by the proper direction of natural agencies, which may, on the one hand, make the light soil cooler and more compact, and absorptive of water and plant food, and, on the other hand, the heavy one less compact, and to freely permit the circulation of air and water, thus changing the chemical character in such a way as to enable the plants to obtain an abundance of food otherwise unavailable.

In a general way, the four chief ingredients in soils are sand, clay, lime and vegetable matter, or humus, and which, existing in proper proportion, make them productive. Any one of these in themselves would not make a good soil, yet each is essential in order that a good soil may be made. If we assume that a farm is divided into the two opposite types, a heavy clay and light sand, both deficient in vegetable matter and in lime, though with good natural drainage, we have a working basis for a discussion of the methods of improvement by natural agencies which will apply quite as well to the numerous intermediate types.

The deficiencies in the clay soil are that it is too cold, air does not penetrate freely, and it does not warm quick enough to enable an early planting and quick germination of seed; it remains wet and soggy until hot weather, when frequently it becomes too dry, and is then hard and compact, and the plants suffer because they cannot obtain food. In wet weather the water does not evaporate rapidly—it becomes water-logged, and plants scald and die.

The sandy soil possesses opposite characteristics. Its deficiencies are that it is too open and porous, the water moves too freely. It is easily worked, and may be handled at any time without serious damage to its physical character, but when dry times come, the soil becomes too hot and plants burn and wither; the crop is of no value. If it is too wet, they grow rapidly at first, then become yellow, and the crop is a failure, because the food contained is not abundant, and the rains carry it away.

In the first case, what is needed is to direct the natural agencies, sun, air and water, in such a way as to make that soil less compact and adhesive, and to permit the air to penetrate more readily, the water to move more freely, and thus encourage chemical changes, as well as providing for the activities of bacterial life, which have a tendency both to add to and to set free the plant food that is locked up in soils of this character. In the other case, what is needed is the introduction of vegetable matter, which will make the soil more compact, more retentive of moisture and plant food, and a better medium for the development of those living agencies which are so important a factor in promoting the absorption of the atmospheric elements.

The question that naturally arises here is, what are the natural agencies that must be invoked in order to accomplish these beneficent purposes? First, the atmosphere, the sun and air, cold and heat. The air circulating freely in soil causes chemical changes, oxidizes, helps to rot the compounds, setting free food elements that were locked up in unusable compounds; the warmth carried by the air assists in the process. These are largely chemical changes, though resulting as well in physical improvement, as is evidenced by the breaking down of hard particles by alternate freezing and thawing.

In the second place, water is a natural agent, as it is a universal solvent, and its freer movement in soils makes active the dormant constituents, which, being carried in dilute solutions, presents them to the plant in usable forms.

Third, organisms, low orders of life, which, while unseen, exist in all soils for good or evil, the good ones existing only in soils that permit the free circulation of air and water, for, like the higher orders of life, they must have air, a proper degree of temperature and the right amount of moisture, in order to live and perform their functions. They feed upon the constituents of the atmosphere and soil, and by their life and activity not only break down the insoluble compounds, but add to the constituents by absorbing nitrogen from the air. Those that work evil exist in soils that do not freely permit the free circulation of air and warmth, and are cold and wet and free from organic matter, thus they absorb oxygen from usable nitrogenous compounds, setting the nitrogen free, thereby reducing their crop-producing power. These organisms are also affected by the condition of the soil, whether acid, alkaline or neutral; the good ones, especially those which possess the valuable characteristics of absorbing nitrogen from the atmosphere, do not thrive or multiply rapidly in soils that are acid.

Fourth, growing plants, which by their presence not only prevent the losses of food from the soil, but by their growth and the subsequent decay of roots and stubble change and add to their chemical and physical properties. A soil that is left bare during the fall and early spring loses the food that has been made available during the growing season; it remains unabsorbed, and is readily washed out, while one left bare during the hot, dry months is not only deprived of the improvement due to the growth of plants, but is apt to have its living forces destroyed by the high temperatures which then usually prevail, and which penetrate deeply in the absence of the cooling shade of plants.

It is evident, therefore, that if we are to benefit by natural agencies they must be directed; conditions must be made favorable for their activity. If the sun, air, water, living organisms and growing plants are to perform their functions in making plant food available in our soils, or in adding to their stores of nitrogen, the farmer must provide the opportunity by better and more frequent cultivation, which exposes larger surfaces to the action of the air, water and feeding roots, and renders the soils less liable to sudden changes in temperatures in summer, and the consequent destruction of living organisms. He must keep his soil occupied with growing plants to prevent losses of plant food, and to increase the store of vegetable matter, which provides a better medium for the activities of living organisms, besides improving physical and chemical character. He must apply lime, in order to neutralize acids fatal to the life of the bacteria, as well as to cement the fine particles of soil into larger ones, thus increasing the power of the air and water to assist in the perfection of his medium for the growth of crops.

A brief description of the working of these two types of soils, and which result in a rapid improvement, will make clear the application of the principles. In the case of the clay soil, one line of practice might be, first, to plow the land late in the fall, throwing the furrow on edge, so as to expose as large a surface as possible to the freezing and thawing of winter, and to permit a freer circulation of water, both of which agencies change the chemical and physical character, breaking up the chemical compounds, and cementing the fine particles together, unlocking plant food and making it more porous. In warm climates this would result in some loss of plant food, but the loss would be more than counterbalanced by the benefits that would come from the changing of the base existing in the soil. In spring, as soon as the land is dry enough, deep cultivation should be practiced, and it should be preferably limed, in order to make the particles as fine as possible, to permit the heat and water to freely penetrate, and make conditions favorable for quick germination and early growth, because plant food has been made available, which is freely movable in soil solution. A cultivable crop, should preferably be planted, and constant surface cultivation of the crop will help to retain moisture in the lower layers, preventing the baking of the soil in dry times, while at the same time contributing more available plant food. If planted with corn, before or as soon as the crop is harvested, it should be seeded with crimson or mammoth clover, vetch, rye, wheat or any crop that will make sufficient growth in the fall to absorb the soluble nitrates accumulated but not used by the corn, and that might be lost during the winter. This catch crop, in addition to holding plant food and preventing mechanical losses, will accumulate vegetable matter; the entire crop, or the roots and stubble, may be turned in in spring, thus adding to the soil substances which have a tendency to separate the fine particles, and make the physical character better, but also of adding organic substance containing nitrogen, which adds a valuable constituent, but which in its decay assists in the solution of mineral food. In spring, as soon as the catch crop has been harvested, or is turned in, the land should be again seeded with corn, oats or barley; if either of the latter crops, the land, as soon as they are harvested, should be immediately cultivated rather than plowed, and seeded to a summer catch crop, cow peas, soy beans or buckwheat. With any of these crops the seed germinate quickly, and the plants soon cover the soil, keeping it cool and moist, besides contributing to its upbuilding in the ways already mentioned. The land should be limed occasionally, and preferably after plowing and thoroughly incorporated with the surface soil, both to neutralize acidity, and to assist in the helpful decay of the vegetable matter. After the removal or plowing down of the summer crop, the land may be seeded with wheat or grass.

This system does not interfere with any regular rotations, though in many instances adding two or more valuable forage crops, that, in their use, contribute to the improvement. By this treatment the physical character is improved, chemical conditions are made better, the active fertility is increased, and crops are better than if the soil had been allowed to lay bare after the first crop was removed and the consequent losses in condition follow, due to leaching, and to the blowing and washing of the soil.

This system is constructive, and on soils of a high natural strength crops may be grown and removed for a long time without the necessity of large additions of plant food, either in the form of manure or artificial fertilizers. The normal supplies in the soil are capable of providing for good crops; money expended for artificial plant food is saved for future needs. Dependence is placed mainly upon good management to increase the stores of available food.

Experiments that have been conducted at our own station show that this method is entirely practical, and will result both in improving the physical character of the soil, and in the increase of its crop-producing power, notwithstanding there is a constant removal of the essential plant-food elements, nitrogen, phosphoric acid and potash. Soils that ten years ago would not produce an equivalent of more than one ton of hay per acre, have, by this system of management, been brought to an average of two and one-half tons per acre, and constantly improving. Heavy soils that were wet, sticky and cold, now are easier to work, can be cultivated earlier in spring, and produce larger crops every year. In some of the plots the potash removed over and above that supplied has in a short time been more than an equivalent of one ton of muriate of potash, phosphoric acid equivalent to more than one and one-half tons of acid phosphate, and nitrogen equivalent to one ton of nitrate of soda. That is, with attention to and direction of natural agencies, the soil under a constant and large removal of plant food is producing more than double what it did under old conditions.

In the case of the sandy soil, we start with a low content of mineral food, phosphoric acid and potash, as well as a low content of nitrogen; the physical character is also such as to require binding rather than separating the particles, as in the case of the clay soil, hence cultivation will not have the same effect. If in the beginning the soil is limed, preferably with ground limestone, or oyster shells, and the land is planted with some leguminous crop, and only the mineral elements, phosphoric acid and potash applied, the conditions are favorable for a crop, not only of high value from the feed standpoint, but constructive in its character. It builds up the soil in vegetable matter, and adds to the absorptive properties for moisture and plant food, thus reducing the tendency toward wastefulness. The leguminous crop harvested in the fall should be followed immediately either by a winter legume, as vetch, or with wheat or rye, which will hold the soil and prevent losses during the winter, while at the same time adding vegetable matter. This winter crop may be harvested early in the spring, and following by other legumes, or by corn or millet, which are again planted immediately after the one crop is removed by another, so that the soil is constantly occupied with plants, which in themselves have a tendency to not only hold, but to gather food, supplying only the minerals which are essential for the needs of the various crops. By this method the lightest sandy soils may be so improved in chemical and physical character as to produce good crops of vegetables, celery, potatoes, sweet potatoes and tomatoes, crops of high value, which could not be grown successfully when the soils could not hold and absorb either water or plant food.

An experiment in progress for four years in our State shows that it is possible with the application of 1,000 pounds of ground lime and less than $5 worth of minerals per acre to build up the light, sandy soils, and that during the process they will not only pay for cultivation, but produce quite as profitable crops as upon those soils which are regarded as of a better character.

The principles applicable to opposite types apply quite as well to all soils that are intermediate, and made up of different portions of the various soil ingredients. If they were observed in practice the lands of the East might yet vie with those of the West in net results. We may in some instances be obliged to supplement our natural resources by artificial supplies of plant food, but with our nearby markets, whose demands for high-class products are never satisfied, farming in the East should be highly profitable. The soils occupying the granite hills, the sandstone plains, and the alluvial meadows of our Eastern states, have been but slightly depleted of their total plant food; they still have sufficient for many generations to come. We have been living upon the results of the activities of the past, not really occupying the land, not knowing how to direct the natural agencies, or forgetting that they are ever ready to serve us now, and quite as effectually as then. The farmers of Pennsylvania, as well as of all our Eastern states, have still a noble heritage in their soils—"Go ye in and occupy the land."

WHAT THE CHEMIST HAS FOUND IN PENNSYLVANIA SOILS, AND THE RELATION OF CHEMISTRY TO AGRICULTURE.

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The Director of Institutes, in assigning to me the subject named in the program, has set me the task of discussing a topic about which comparatively little accurate information has been collected. This statement applies particularly to that portion of the subject relating to the chemistry of Pennsylvania soils as distinguished from soil chemistry in general.

Permit me to call your attention to the magnitude of the problems confronting us in the study of the soils of our great Commonwealth, omitting for the present all mention of the difficulties belonging to the general subject of the chemical relations between soils and plants.

It must be remembered that soils bear in properties and composition distinct relation to their parent rocks, and at the same time possess qualities varying greatly with the manner of their formation from the rocks.

Let us pause for a moment to consider, as briefly as may be, the broader geological characters of the surface rocks of Pennsylvania. Dr. J. P. Lesley, former State Geologist, says: "The Allegheny Mountain divides it in two nearly equal parts, popularly known as Eastern and Western Pennsylvania, entirely different in geological character and relief surface; Western Pennsylvania belonging to the Mississippi valley region, and Eastern Pennsylvania to the Atlantic seaboard; Western Pennsylvania being one unbroken bituminous coal field, while Eastern Pennsylvania is partly a labyrinth of parallel and interlocked mountains and valleys of the Devonian and Selurian age, and partly an open country of still older Cambrian or Primordial, Azoic or Fundamental strata, across which runs a broad, continuous belt of Triassic of Mesozoic brownstone and trap. Cretacious rocks underlie a narrow strip along the Delaware river below Trenton, and a mantel drift covers the surface of the whole northern part of the State as far south as a line drawn nearly straight from Belvedere, on the Delaware river, to Olean, on the New York state line, and another line drawn nearly through Franklin and Beaver to the Ohio state line, north of the Ohio river."

The surface thus exposed exhibits strata belonging to not less than sixteen of the principal groups of geological measures, including representatives of all geological ages from the earliest to the most recent. The greatest diversity in geological character is presented in the southeastern portion of the State, covering probably 40 per cent. of its area, the remainder of the surface being made up, on the north, of the Catskill sandstones; in the extreme southwest, of the Pittsburg coal measures, and, over the remaining central and western parts of the State, of the sandstone, shale and conglomerate formations more recent than the Catskill. The northern plateau of the State is drained by three streams, one flowing north into Lake Ontario, another southeast into the Chesapeake, and another southwest into the Ohio, disregarding the relatively small territory which is drained by the Delaware and its tributaries.

Over these great areas we find soils of the three main types of formation—sedentary soils, those formed by weathering and biological agencies from underlying rocks; alluvial soils, formed from rocks and sedentary soils by steam transportation, and, finally, glacial or drift soils, formed by the transporting section of glaciers. While Pennsylvania has no high mountains, the land surface is so broken that there are everywhere found the conditions that favor the removal of soluble matter and finely divided particles from the uplands to the valley floors. In the glaciated region occur numerous lakes of varying size and depth, many of which have in the course of time been shallowed and filled by silt carried from the neighboring hills and by dense vegetation, so that today the beds of these lakes are filled with swamps and beds of peat and muck.

The result of all these causes is a wonderful diversity of crops. The agencies, State and national, which might have collected valuable information concerning these soils, have as yet accomplished little. It is true that scattered through the reports of the Second

Geological Survey are numerous interesting statements concerning the soils of various localities, considered particularly in relation to their parent rocks, but these observations have never been collated for comparison, were not made according to a carefully prepared system of observation, and, commonly, afford little information concerning the agricultural relations of the respective soils. The Experiment Station has found its funds altogether too limited to undertake a systematic soil survey of the State, and has been obliged to limit itself to such casual examinations as could from time to time be made in the study of various local problems. Within very recent years the Bureau of Soils of the United States Department of Agriculture has mapped the soils of several counties—Adams, Montgomery, Chester, and parts of Lancaster, Lebanon, Dauphin and Clinton. The surveys made by the bureau classify soils primarily upon very broad geological and physiographical relationships, and, secondarily, upon textural characters of surface and subsoil, with scant attention to the mineral and chemical composition of the various soil classes. The reports of these surveys thus far published exhibit thirty-six distinct soil classes. When the western and northern parts of the State shall have been mapped, a large addition to the number of types will appear, probably similar, most of them, to the types found in the regions of Ohio and New York thus far mapped.

In considering how to select and shape the materials at command, so that they may best serve your purposes as instructors in the theory of practice of agriculture, I have decided to bring to your attention some of the problems with which the soil chemist is wrestling, using Pennsylvania data for illustration, so far as they prove fit.

By way of introduction to these problems, let us take a bird's-eye view of the manner in which our soils have been formed. Their ancestral rocks were great crystalline masses, made up chiefly of silicates of potash, soda, lime, magnesia, iron and alumnia, with small but well-distributed amounts of phosphates of lime, iron and alumnia, and other compounds and elements. These formed the backbone of the new continent lifted above the waters of the ocean. Its rocky surfaces were riven and powdered by the summers' heat and winters' frost, with their alternate expansions and contractions. The winds carried from place to place the dust thus formed, rivulets gathered up the loose fragments, rolled the angular stones into round pebbles, and, using the rolling and suspended rock fragments as abrasive agents, became a liquid sandpaper, scouring and indenting the rocky stream beds, and finally in the lowlands widened, dropped the coarse sand, then the fine clay, and poured into the ocean basins. The rains filled the rock pores, formed new, hydrated minerals of enlarged volume, promoted the oxidation of metallic elements, and, finally, with the aid of the carbonic acid of the atmosphere, slowly broke up the silicates, dissolved and carried away the chloride of soda, potash and magnesia, and the carbonates of lime and magnesia, and delivered them to the ocean, leaving on the land surfaces, finely divided rock debris, of which the silica and other insoluble substance formed a larger proportion than they presented in the newly exposed rock masses. Presently the carbonate of lime and magnesia formed in the shallows of the ocean waters great beds of ooze, molluscan shells and coral reefs, more or less mixed with sand

and clay, and with organic substances, the remains of marine organisms. In subsequent geological disturbances these beds were uplifted from the waters, sands forming sandstones, the clays, shales; the ocean ooze, the limestones, and these in turn were again attacked by the same pulverizing, transporting and dissolving agencies. These rocks, however, exhibited some contrast to the original crystalline rocks, in that the sandstones and shales contained less, the limestones a larger proportion of soluble materials than their parent rocks.

Other differences, too, marked these later periods. During the changes in position of the earth's strata streams of molten rock broke through rifts in the surface, forming the great crystalline trap dykes found in Adams, Lebanon and more eastern counties. Also, as the result of heating, compression and other agencies, sedimentary rocks became crystalline, as we see them in the metamorphic granites, porphyries and schists of the southeastern counties. Moreover, the great ice streams of the north overflowed the northern counties, chiseled the mountain sides, and deposited great masses of well-mixed boulders and fine debris, thus forming the glacial drift.

Biological agencies, too, have contributed largely to soil formation. A great variety of organisms from the minute bacterium, to the giant of the forest, have, each in its own way, and in its own order, helped to transform rocks into the soils we till. Helping to dissolve the minerals, gathering up with their organs the elements they required, and upon their death leaving these elements as a more concentrated, better elaborated food for the succeeding tenants, the earlier inhabitants have, in their last decay, continued to dissolve the earthy walls about them. Let it be remembered that these soil-forming agencies are still at work, that the soil we till are not the product of a single geological transformation, but have been made over and over again, and that even now our fertile plains are paying excessive tribute to the seas, while the rocks beneath our subsoil and the mountain tops are crumbling and turning over annually to our use the rich material from which we shall, if we are wise, coin golden harvests.

Whenever we bring the subsoil to the air by drainage, or by aid of our plowshares, we set up oxidizing processes, change the soil climate, and fit it for a new flora; conversely, when we suffer our surface lands to become too compact, or to be shut off from the air by standing water, we set up a train of reducing actions, by which wholesome foods are turned to poisons, and make the former soil residents yield place to others that minister less to our wants.

As masters of the land we are not, however, interested in geology as a history of the past, but study its processes and forces that we may make them servants to our present use, as the master of the sea studies the ocean chart, so that by setting the sails and turning the rudder of his frail bark he may make the winds and currents his servants, to carry him whither he wills.

The soil serves the plant in a variety of ways. Its texture, its heat and cold, moisture and drought, helpful or harmful population of lower organisms, all form factors of environment important in determining its fitness for the satisfactory development of our crops. No system of soil study, classification or judging is complete unless it give due attention to each of these factors.

The psychist and biologist have important duties to perform in their field of service. Chemistry unaided cannot solve the problems that arise. It is, however, to the chemical side of certain soil questions that I wish to direct your attention.

Analysis has discovered the fact that plants contain many of the elements present in the soil, and experiment has proven that in order to grow and perform its full range of functions the plant must find in the soil water to drink and oxygen to breath, and from it must also obtain a suitable supply of nitrogen, potash, lime, magnesia, iron, phosphoric and sulphuric acids; and that, in addition to these materials, it usually takes up from the soil more or less soda, manganese, chlorin, silica and carbon, but, strangely, that alumina, abundant in the soil, is rarely found in plants. Experience has further shown that in most well-managed soils crops are sure to find suitable supplies of all essential food elements except nitrogen, phosphorus and potassium, but that many soils, otherwise fertile, are deficient in the elements last named, either in point of quantity or of fitness for the plant's consumption. Hence, the distinguished investigator, who has just preceded me on this program, ventured, a few years since, to define agriculture simply as the art of converting the nitrogen, phosphoric acid and potash of the soil into the more valuable forms of grain, fruit, meat and milk.

When chemistry was first applied to the study of farm problems, it was supposed that, having at command the means of determining, on the one hand, how much of each element the growing crop requires, and, on the other, the exact quantity of the required element present in the soil of a given field, the chemist could at once determine what food constituent, if any, was lacking, and what should be given to the soil to make good the deficiency, thus saving the farmer many a season of expensive experiment and many a dollar of needless expenditure. It was soon found, however, that after excluding cases in which the failure was probably due to physical and biological, rather than to purely chemical, conditions, the solution of the remaining questions by the recognized chemical methods was far more difficult than had been anticipated. Let us review some of the steps chemists have taken in hope of gaining a satisfactory basis of judgment respecting the chemical fitness of a soil for the maximum production of a particular crop.

When a rock or a mineral is to be analyzed, methods are selected which will serve to separate completely all of each constituent from every other substance present. It was recognized that plants effect no decomposition so far-reaching. Accordingly, the action of boiling concentrated hydrochloric acid was substituted for the more drastic processes of mineral analysis. Even this method was not used with the expectation that it would show precisely what a given crop, or even a crop of average feeding power, could remove from the soil in a single growing season. It was promptly recognized, also, that by varying the time of action of the acid the temperature, or the acid strength, results differing considerably with respect to certain constituents, would be obtained. It was, at the same time, clearly perceived that in different soils, or even in the same soil, a single element might exist in several states of combination with other elements, each combination having its own characteristic fitness or unfitness for consumption by plants. The method was nevertheless adopted with the hope that it might at least solve some of the soil problems, and is still retained, with very strict definitions of the details of its operation, to afford a rough approximation to the total supply in a soil of material in condition for plant use, or in such state that it will probably be made available within a reasonable period by proper farm management.

Pausing just to note that, by the action of the acid under the accepted conditions of extraction, the soils' combined carbonic acid is set free as a gas, the silica from decomposed silicates is largely left as a gelatinous solid mixed with the undecomposed minerals, and that the remainder of the mineral constituents are taken up into the acid solution, let us consider a few of the results obtained by this method of study.

We note, in the first place, that the more siliceous rock surfaces are weathered, the more fully are the weathered portions decomposed by acid. Thus Merrill found that of a certain gneiss, the freshly exposed rock was decomposed by acid to the extent of 30.47 per cent. only while highly weathered portions were decomposed to the amount of 69.18 per cent.; also, that a fresh diabase from Bedford, Mass., was decomposed to the extent of 36.23 per cent., the highly weathered rock 32.28 per cent., and the silty substances, separable from the latter by washing, to the extent of 77.52 per cent. A similar difference appears when the decomposition by acid of the sand and clays, respectively, of the humid region is considered. The air-dry sands usually exhibit 85 to 90 per cent, and upward of matters not attacked by acid, the clays only 65 to 70 per cent. Thus the Pennsylvania sandy loam soil of Northern Lancaster county, on which our experiments in growing Sumatra wrapper leaf tobacco have so satisfactorily progressed, show from 86 to 90 per cent. of acid-resistant matters, while the Hagerstown loam soils from the limestone region of the county, on which the greater proportion of the filler tobaccos' are grown, show but 67 per cent. The similar nature of these comparisons between rock and soil is at once recognized, when we recall that the clays represent the finer, more highly weathered portions of the parent rocks. The least amount of acid-resistant material found in any soil was that given by a Cuban limestone soil, analyzed in the writer's laboratory, viz., 7.42 per cent. This is very nearly the figure obtained from Longbridge in the analysis of the finest clay particles washed from a heavy Mississippi soil, viz., 15.96 per cent.

Before speaking in further detail of the results obtained from the acid analysis of Pennsylvania soils, several other points of fundamental importance in their interpretation must be considered.

It is a matter of common experience that the finer the subdivision of a substance, the more rapidly it dissolves. This is due to the fact that fineness of subdivision greatly increases the extent of surface exposed by a unit weight of the material to the action of the solvent liquid. For example, a cube measuring two inches on a side inch on a side, it will yield eight cubes, each having a superficial area of 24 square inches; whereas if it be split into cubes measuring one inch on a side, it will yield eight cubes, each having a superficial area of six square inches, making a total of forty-eight square inches. This effect is, however, one of rate, and but slightly influences the final concentration of the solution. It might be supposed, at first thought, that the quantities of matters yielded to solvents in a short time by coarse sands and fine clays would be governed by the difference in the respective sums total of the superficial areas of their particles. The difference between sands and clays in the diameters of their particles is, indeed, far greater than most suppose. Thus Whitney found in an ounce of pine barren sand 1.7 billion particles, with 15.4 square feet of total surface; while a fine limestone clay contained 690,000,000,000 particles, with 173 square feet of total surface. But the matter is not to be so simply dealth with. For, in the first place, the composition of the clays and sands of the humid region is not the same. The sands are largely coarse grains of nearly pure quartz or silica, and Longbridge found that particles over 1-1000-inch in diameter derived from a sandy soil, gave up nothing whatever to acid. Clays, on the other hand, are largely composed of very fine particles, consisting not only of kaolin, or pure china clay, but also of a very great variety of mineral compounds, including many that are quite readily decomposed by acid.

It is found needful, in judging of the probable fertility of a soil from its analysis, to take into account the total weight of material useful to the crop, and for this purpose the weight of the soil in the volume occupied by the principal root system is adopted as a basis of computation. A cubic foot of air-dry loam, representing the plow depth (eight inches) on the Experiment Station farm, weighs sixty-eight pounds, while an equal volume of sand weighs 110 to 120 pounds, or nearly twice as much. Moreover, crop roots extend more widely and deeply in sandy soils than in more compact lands.

Hilgard found, indeed, by a very interesting experiment, that a compact adobe soil through which roots extended but a short distance yielded, upon dilution with pure quartz sand, a much more extended root system and a heavier crop up to the point when the diluent sand exceeded 80 per cent. by weight of the soil mixture.

In the preparation of soils for analysis, it is the general custom to exclude all stones and gravel, in fact, everything that will not pass a sieve with meshes of one-fiftieth inch (0.5 millimeter).

The state of combination in which the acid-soluble constituents exist in the soil greatly affect their availability, and while we are unable from the results of the analysis by use of strong acid to determine with certainty the exact nature of the original combinations. we can by consideration of the proportions of the dissolved constituents to one another gain upon this point some notions of general value. In particular, it must be observed that if soil be well supplied with lime carbonate, the potash, nitrogen and phosphoric acid are more available than when the lime carbonate is deficient; whereas, with a large proportion of alumina, or lime hydrate, the phosphoric acid is probably but slightly available. As the result of extensive analyses of European soils. together with a study of their several crop-producing powers, Maercker has compiled the following schedule of ratings for soils, according to their percentage composition in terms of their principal plant food constituents.

PRACTICAL RATING OF SOILS BY PLANT-FOOD PERCENTAGES, ACCORDING TO PROF. MAERCKER, HALLE STATION, GERMANY.

Grade of Soil.	Potash.	Phosphoric acid.	Lime.		Total nitrogen.
			Clay soil.	Sandy soil.	
Poor,	Below 0.05	Below 0.05	Below .10	Below .05	Below .05
Medium,	0.05—0.15	.05— .10	.10— .25	.10— .15	.05— .10
Normal,	0.15—0.25	.10— .15	.25— .50	.15— .20	.10— .15
Good,	0.25—0.40	.15— .25	.50—1.00	.20— .30	.15— .25
Rich,	Above 0.40	Above .25	Above 1.00	Above .30	Above .25

These ratings agree well with American experience outside of the arid regions.

I give below the results of analyses by strong acid of a number of Pennsylvania soils, as respects the constituents of most interest to us:

	Coarse material, per cent.	In Fine Material.				Nitrogen, per cent.
		Potash lime, per cent.	Lime, per cent.	Magnesia, per cent.	Phosphoric acid, per cent.	
LIMESTONE SOILS.						
1. Hagerstown Loam, Donegal, Lancaster co.:						
Surface,	11.4	.62	.61	1.26	1.91	.110
Sub-soil,	13.2	.67	.62	1.19	1.77	.094
2. Conestoga Loam, Rocky Spring, Lancaster co.:						
Surface,	18.8	.67	.41	2.05	.265	....
Sub-soil,	16.0	.66	.25	1.93	.180	.052
3. Nittany Valley, Limestone "Silt Loam," State College,	....	.34	.26	.35	.124	.116
4. Limestone Clay, Morrison's Cove, Bedford co.,	50.0	.805	.29	.44	.140	....
OTHER SOILS.						
5. Iron Bearing Clay, Edgely (Archaean Rock),	....	.28	.22	.11	.140	.136
6. Micaceous Clay, Haverford, Delaware co.,	....	....	....	....	....	....
7. Norfolk Gravelly Loam, Marietta, Pa.:						
Alexander,	....	.501	*.392	.444	.072	....
8. Garber, N. of Marietta,	....	.111	.150	.362	.046	....
9. River Loam, Wysox, Bradford co.:						
Surface,	....	.39	.52	.35	.260	.062
Sub-soil,	....	.55	.37	.21	.250	.056
10. Norfolk Silt Loam, Blanchard, Centre co.,	12.0	.33	.29	.45	.127	....
11. "Glacial Loam," Scrubgrass township, Venango co.,	40.0	.27	.08	.19	.092	....
PENN SANDY LOAM.						
12. Mastersonville (Level upland),	5.5	.21	.187	.280	.028	....
13. Risser (Gentle slope),	6.8	.21	*.347	.380	.015	.166
14. Halderman (Gentle slope),	11.3	.26	.214	.208	.012	.073
15. Olewinder (Foot of steep slope),	9.0	.364	.874	.116	.076	.096
16. Burkholder (near top of gentle slope).						
Surface,	13.0	.15	.330	.150	.140	....
Sub-soil,	13.0	.175	.210	.170	.070	....
Range P. S. Loam:						
Surface,	5.5-13.0	.15-.36	.187-.874	.116-.380	.07-.140	....

		In Fine Material.				
	Coarse material, per cent.	Potash lime, per cent.	Lime, per cent.	Magnesia, per cent.	Phosphoric acid, per cent.	Nitrogen, per cent.
Average P. S. Loam:						
Surface,	9.1	.239	.390	.223	.053	.112
PENN LOAM.						
17. Cocalico (Level field):						
Surface,	6.4	.225	.17	.22	.16	....
Sub-soil,	16.0	.240	.37	.195	.11	....
PENN STONY LOAM.						
18. Cocalico Township (Sloping hill-side):						
Surface,	....	.135	.38	.32	.19	....
Sub-soil,	....	.205	.215	.31	.095	....
HAGERSTOWN GRAVELLY LOAM.						
19. Schoeneck, Lancaster Co.						
Surface,	....	.27	1.090	.440	.350	....
Sub-soil,	....	.27	.680	.060	.345	....
HAGERSTOWN SHALE LOAM.						
20. Blanchard, Pa.,	....	.415	.280	.680	.151	....
21. Mauch Chunk, Red Shale, Gratz, Dauphin co.,	....	.400	.250	.430	.080	....
22. Hudson River Slate (Black slate), Hopewell township, Cumberland co.,	....	.385	.240	.710	.204	....
23. Cecil Clay (From trap dykes), Washington township, Lancaster, co.,	....	.325	.830	.750	.060	....

Let us note first the quantity of lime in the fine soil from the respective formations and localities. The percentages ranged from .08, in the "glacial loam," from Venango county, to 1.09 per cent., in the Hagerstown gravelly loam from Schoeneck, Lancaster county, samples. It should be said that most of the samples came from long-cultivated fields, which had doubtless, in accordance with local custom, received more or less frequent and heavy dressings of lime. In the cases marked with an asterisk, white lime particles were distinctly visible in the soil. In but one of these soils, the Venango glacial loam (No. 11) is the lime percentage so low, when considered in connection with the soil texture, that the soil must be termed "poor." Notwithstanding this fact, Nos, 3, 4, 10, 20, 21, 22 and 23, as well as No. 11, have all proven highly responsive to liming. The full functions of lime are not performed by any lime compounds save the hydrate or carbonate, although the other lime-containing substances attacked by acid would doubtless serve in general to supply to the lime needed by plant for food. Lime silicates would not be so active in liberating potash, phosphoric acid or nitrogen, and probably would not favor the same bacteria that prosper in the presence of the carbonate. In but one of the soils last named was there enough carbonic acid to combine with more than one-fifth of the lime present, and that soil was not directly derived from a limestone, but was No. 11, the drift soil. In No. 23 the Cecil clay, containing .83 per cent. of lime, there was enough carbonate to combine with but one-twentieth of the lime dissolved out by strong acid.

There is another fact very evident respecting the lime. It is often remarked with surprise that limestone lands are capable of giving profitable returns from liming. These analyses reveal the fact that despite their origin they are not especially rich in lime, and that most of the lime present is there in some other compound than the carbonate. Since, moreover, the principal limestone lands in Pennsylvania are clayey or loamy, rather than sandy, they require a higher lime percentage than do soils of lighter texture, to produce a given effect.

It is commonly believed that lime passes readily from surface to subsoil and out through the drains. The composition of drainage waters shows lime salts as the most abundant dissolved constituents. In Nos. 1, 2, 9, 16, 17, 18 and 19, we are able to compare surface and subsoil as to their lime content. Must of these soils had not been recently limed, yet No. 17 alone shows the subsoil to be the richer. It would appear from this that the downward progress of the lime is less rapid than many believe.

Regarding the potash, we find that in no case is the percentage so low that the soil would be ranked as "poor," and that in but three cases of alluvial and sandy soils, Nos. 8, 16 and 18, are the quantities so far deficient as to rank the soils as "medium." Virtually one-third of the surface soils examined are rich in potash. Limestone clays are especially well supplied with potash, particularly that in the limestone loams and clays. The Nittany Valley sample contains far less than the Lancaster county and Bedford county soils. The shales also are well supplied with this material, as are the Delaware county micaceous clay and the Cecil clay, of Adams county. Comparing soil and subsoil, there is a curious difference in the quantities in the Norfolk gravelly loams along the banks of the Susquehanna at Marietta. Sample No. 7, and also sample No. 15, which in like manner differed from the other Penn sandy loams examined, were taken from the lower portions of rather steeply inclined slopes, and contain more silt, and possibly more clay, than do samples 8 and 12 to 14, respectively. This very possibly accounts for the observed differences in potash. Considering the relations of soil and subsoil in the case of samples 9, 16, 17 and 18, the subsoil is distinctly richer, while in the case of No. 2, the surface soil has the greater percentage.

In the case of phosphoric acid, we find a very different state of affairs. All but one of the Penn sandy loams and the Norfolk gravelly loams are "poor." The Cecil clay, the Mauch Chunk red shale and the Venango glacial loam are but "medium." The Conestoga loam of southern Lancaster county, the micaceous clay of Delaware county, the Hagerstown gravelly loam of northern Lancaster county, and the rich elluvium of the Susquehanna, near Towanda, are the only samples that would be classed as "rich" in phosphoric acid. Comparing surface and subsoil, we find, without exception, that the former contains the greater proportions of phosphoric acid. This might be ascribed to the fact that on most of the lands analyzed commercial phosphates have been used, and, being immediately converted into comparatively insoluble substances, have not been leached away, but it may also be explained from the fact that by the weathering of the surface soil, the more soluble materials are carried away in the drainage waters, leaving behind relatively insoluble phosphates in a greater proportion to the residue. The opposite tendencies of cropping would not immediately destroy the balance of phosphates thus established. The facts here observed are strictly in accord with those noted in the comparison of the fresh and weathered portions of rocks, and, indeed, in the case of soils, everywhere.

The nitrogen relations will be considered at a later point.

It was noted half a century ago that the results obtained by analyses such as those just given very frequently failed to throw light upon questions in which the present fitness of the land for producing crops in general or a particular crop were at issue, rather than questions relating to permanence of fertility, and it soon came to be recognized that while such analyses afforded much information valuable for many purposes, there were many other purposes with respect to which the analytical results were either useless or misleading. There are several reasons by which this fact may be accounted for: In the first place, we observe that soils are often very responsive to additions of small quantities of some fertilizer constituent; indeed, a very common dressing of phosphoric acid is thirty pounds per acre, the amount contributed by 200 pounds of dissolved phosphate rock. The soil taken to the depth of a foot over an area of an acre weighs from two and one-half to four million pounds. If the weight be taken as three million pounds, you will perceive that the effective quantity of added phosphoric acid bears no greater proportion to the entire substance than one part on one hundred thousand. In the case of soluble nitrogen compounds, such as nitrate of soda, we have a still more striking illustration. A dressing of twenty pounds per acre is frequently found to improve the early vegetation of a grain crop, yet this dressing contains but three pounds of nitrogen, a weight equal to but one-millionth of that of the soil. If we examine the analytical methods with reference to the degree of refinement of which they are capable, we find that it is rarely possible to secure between double determinations agreements as close as one part in ten thousand; even such degree of delicacy is far more than we can profit by, owing to the fact that the errors of sampling lead to far greater differences. While, therefore, analyses by strong acids have high value for certain purposes, and are essential to a determination of the agricultural resources of the territory, they do not furnish such information as will usually enable us to predict what fertilizers are at present most needed in the case of lands above the rank of "poor."

Chemists have therefore sought other methods in the hope of obtaining some more perfect indication of the percentage availability of the food constituents in their particular soils. The methods have not depended upon the securing of more exact information respecting the combinations in which the nutrient elements are held, but simply upon the proportion in which they are given up to mild solvents. For this purpose very dilute mineral acids and organic acids, with a lower decomposing power have been used. Dr. Dyer, at present chemist at the Royal Agricultural Society of England, made a careful study of the solvent qualities of a 1 per cent. solution of citric acid for this purpose, and found that by means of it he was able to extract from the barleyfields of the Rothemsted Experiment Station quantities of phosphoric acid and potash corresponding very closely to the net amount supplied as fertilizers for a decade after deducting the quantities removed by the crops. He concluded that when the soil yielded less than .01 per cent. of phosphoric acid, or than .005 per cent. of potash, there was not enough of these respective constituents present in available combination to permit the growth of a maximum crop. The application of this method in many localities over the world has shown that it is often valuably suggestive, but that there are soils for which its results are not indicative of the true state of fertility. Thus the red volcanic soils of Hawaii, exceedingly rich in iron, give to the citric acid solution more phosphoric acid than sugar can remove, and for these soils, aspartic acid has been found the preferable solvent. The Dyer method has been employed in the examination of a number of Pennsylvania soils. We will very briefly consider the results obtained.

ANALYSIS BY DILUTE CITRIC ACID.

	Potash, per cent.	Phosphoric acid, per cent.
LIMESTONE SOILS.		
Hagerstown Loam, Donegal, Lancaster co.:		
Surface,	.053	.044
Sub-soil,	.064	.042
Conestoga Loam, Rocky Spring, Lancaster co.:		
Surface,	.037	.123
Sub-soil,	.010	.055
Morrison's Cove, Bedford co., Pa.,	.0136	.0082
Nittany Valley, Silt Loam, State College, Pa.,	.0190	.0139
OTHER SOILS.		
Iron Bearing Clay, Edgely, Pa.,	.016	.015
Cecil Clay, Adams co.,	.0133	.0057
Micaceous Clay, Haverford,	.1041	.0571
Hagerstown Shale Loam, Blanchard, Center co.,	.0150	.0306
Mauch Chunk Red Shale, Gratz, Dauphin co.,	.0107	.0088
Black Slate, Cumberland co.,	.0220	.0111
Norfolk Silt Loam, Blanchard, Pa.,	.0150	.0146
Venango Glacial Loam,	.0117	.0130

Not one of the soils examined appears deficient in potash, according to Dyer's standard. It must be recalled that this standard is based chiefly upon results obtained with barley and grasses, and is not strictly applicable to crops of different feeding habit. Although the available potash shown by the citric acid method in the limestone soils of Lancaster county is far more abundant than the minimum standard, tobacco required for its best development liberal potash dressings on both the Hagerstown and the Conestoga loams. But for staple crops, with the possible exception of potatoes and other root crops, the much smaller percentage found in the Nittany Valley limestone loam is sufficient.

As to phosphoric acid, the results show the Morrison's Cove limestone, the Edgely and Cecil clays, the Dauphin red shale, Cumberland black slate and Venango glacial drift soils, seriously near or even below the danger point. The Nittany Valley silt loam, though it holds more than Dyer's minimum, .01 per cent., of citric soluble phosphoric acid, requires that element for the best development of all staple crops, including even such vigorous feeders as oats and rye. Tobacco shows for phosphoric acid the same low feeding power that it exhibits for potash, and five years' experiment at Donegal showed a marked return from phosphoric fertilization, while the Conestoga loam, with three times the citric soluble phosphoric acid appearing in the Donegal soil, showed no gain from phosphoric applications, until after several years' continuous cropping with tobacco had depleted the more available amounts. We may, therefore, regard results obtained by the Dyer method as valuably suggestive, but not conclusive, with respect to a present deficiency in potash and phosphoric acid.

There is much study at the present time of the relations between soil fertility and the solubility of the various soil constituents in water, as shown by newly devised methods supposed to be very delicate. Scientific proof of the sufficiency of the methods of analysis is not yet adduced, and, inasmuch as the results offered in evidence are conflicting, and represent few samples of Pennsylvania soils, they will receive no extended consideration at this time. Mention of the method suggests a statement, however, of the present theories concerning the manner in which plants take up their soil foods, and the materials that supply them. Plants have no mouths by which their roots may devour food. The tender skins of the young roots and root hairs are much like the walls of the animal stomach and intestines, and drink up the substances already dissolved in the soil moisture, or else, by means of the organic acids contained in their cells, or by aid of the carbonic gas they excrete, attack the solids with which they lie in close contact, and take from them food substances, much as the strawberry absorbs sugar with which it is covered. There is one school of plant physiologists and soil investigators who hold that the quantity of food absorbed directly from the soil particles is not considerable, as compared with the quantities obtained through the general solvent action of the soil moisture. From all the facts I have at command, it is my judgment that direct action by the roots, which has been repeatedly proven to occur, is one of the food-consuming activities of the plant too important to be left out of consideration in any theory of soil fertility.

I have said nothing concerning the humus and nitrogen of the soils. The relation of humus to soil fertility is one of prime importance, but the limits of time prohibit its adequate discussion at this time. I will simply say in passing that the decaying organic matters in the soil enter into combination with part of the mineral matters. Snyder and Ladd have found that the yield of wheat by the prairie loams of Minnesota and North Dakota has a close relation to the amounts of phosphoric acid and nitrogen in the more soluble part of the humus. Similar relations are not, however, of general occurrence.

From the consideration of what I have already said, you will, I trust, have gained a fair notion of both the values and the limitations of soil analysis by the present methods, and, from a comparison of the results obtained in the analysis of limestone soils, and of the Penn sandy loam series, will have come to judge how far analyses from a single locality on a formation may afford indications of value with respect to the formation at large, especially if the topography be considered. You will also understand why the station declines to spend from $10 or $100 on a complete analysis of a spoonful of soil taken up haphazard from a farm or from a town with the hope that upon the results of analysis a rule may be evolved for the successful management of the property concerned.

Agricultural investigations have, in the search for methods useful in guiding fertilizer practice, turned to the chemical analysis of the crop produced upon a given soil, and to direct trial of yields by experimental use of different fertilizers on a small scale.

In examining the composition of the plant as an indicator of the soils' deficiencies, the results of analysis of different organs from plants grown on soils deficient in particular ingredients, and from plants grown on plats of the same land in which the deficiency has been made good by fertilizers, are used.

The results of analysis are expressed in the form of ratios existing between the three important fertilizer constituents present in the dry matter of the particular plant part used. The quantity of nitrogen is usually taken as 100. From such examinations, Atterburg, examining the seed, concluded that if the ratio of phosphoric acid to nitrogen were less than 50 : 100, the maximum crop could not be obtained, and if the ratio were less than 20 : 100, it might be concluded that a serious deficiency of phosphoric acid existed. Stahl-Schroder from similar studies fixed upon the ratio 30-40 : 100 and 20-30 : 100 as more nearly correct than those fixed by Atterburg. Mr. H. H. Pingree,* late assistant chemist in my laboratory, made a careful study of the oats crop grown on a number of our fertilizer plats at the station, and obtained results similar to those just mentioned. It is probable that this method of examination of a soil's condition would require as a basis of judgment a careful analysis of the crops contained from a series of fertilizer plats on the soil in question. The trials of this method have not been sufficiently numerous to permit a safe judgment as to its limitations.

Another class of methods for testing present needs of the soil involves a comparison of the crop yields obtained from the unfertilized land, and from that treated with various fertilizer constituents and combinations thereof. I will refer first to those methods of this class, which are designed to be conducted on a small scale, and, it may be, at some point remote from the farm under study. In such case representative portions of the soil are packed into pots, the latter being first provided with a layer of coarse material to insure the proper drainage. The upper layers of the soil in some of the pots receive the additions of fertilizer, and the weight of crops produced in the several pots is accurately determined. In such experiments care is of course taken to preserve, so far as practicable, similarity of conditions with respect to the manner in which the soil is packed into the pots, the temperature and the moisture during growth. Heretofore it has been customary to use rather large pots and to grow the crop to maturity in order to gain the comparative data. It is a common fault of such experiments, no matter how carefully conducted, that they do not exactly reproduce the temperature, moisture and aeration conditions that influence the crop grown on the undisturbed soil, and it is well known that each of these conditions is an important factor in determining crop growth. No matter how carefully conducted such experiments may be, it is clear that they are of value as preliminary trials suggesting probable needs of the lands rather than as conclusively showing both the kind and the proportion in which the several fertilizers may be required.

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*See Report of the Pennsylvania Experiment Station of 1905-6, pp. 43-53.

Pot experiments of the kind just mentioned are somewhat cumbrous and extensive, and require an entire growing season for their completion.

The Bureau of Soils of the United States Department of Agriculture has recently proposed another method in which baskets, three inches in depth and diameter, made of paraffined wire gauze, are used instead of large pots. A single species of plants has been selected for use, namely, a hardy variety of wheat, a half-dozen seedlings being employed for each pot. The plan involves the observation of the manner of growth during a period of five weeks, and a determination of the green and dry weights of crop developed by the end of that period. It is clear that where so small quantities of soil are used that the difficulty of securing representative portions is increased. This tendency to error is somewhat offset by the possibility of conducting the same treatment upon a number of pots, say five or six, and using the average result rather than that obtained from the trial of a single pot culture. It is very certain also that the results obtained during so small a portion of the cycle of growth of a plant cannot accurately represent the results that would be obtained in the whole cycle. To illustrate, much of the soil nitrogen is not directly available to plants, but becomes available by the action of nitrifying bacteria during the season of growth. The rate of nitrification under field conditions is not uniform through the growing season, nor is all the nitrogeneous material of the soil equally susceptible to nitrification. These facts make it very improbable that even under field conditions the first six weeks' growth of the wheat crop will accurately represent the soil changes and plant gains through the whole season. The results thus far obtained by the use of the wire-basket method indicate that it has considerable value as a means of determining the kind of fertilizer deficiency in the soil, but that it does not afford conclusive evidence respecting the proportions in which the deficient constituents must be supplied in order that a maximum wheat crop may be secured, assuming that the conditions of culture and season are most favorable. Since it is clearly established that one crop may do fairly well where another species fails, it is clear that the wire-basket test with wheat, or, indeed, a test of the soil by any method with wheat, cannot afford very certain information as to the deficiencies of the soil for the crops of other species, such, for example, as clover, potatoes or turnips.

For these reasons, while the pot methods are to be regarded as highly available means of soil examination to be conducted at central stations, where continuous and skilled supervision can be given, the need remains for tests also upon the soil in place. To reduce the costs of such tests, and at the same time to make possible their more accurate performance, experiments upon small plats rather than upon large fields have been preferred. Another reason for this preference is that by duplicating the series of plats receiving the several treatments under comparison, it is possible to generally reduce the errors due to local variations in the character of the soil.

The Experiment Station has not been able to enter largely into the test of Pennsylvania soils by pot-culture methods. It has, however, recently inaugurated a series of soil tests with fertilizers fitted for the growing of corn, wheat and potatoes. In 1906 I secured the co-operation of over 100 farmers, and this year there are over seventy-five tests for corn and potatoes in progress. Part of the tests of this year, I am glad to say, are repetitions of those made last year. It is important that the results through several seasons be obtained, since fertilizer effects are very considerably influenced by the character of the season. It has not been possible as yet to report the details of these co-operative tests. I have, however, called out some of the more interesting results.

Experimenter.	Geographical Location.	Geological Formation.	Topography.	Soil Texture.	Nutrient Deficient.*
	Allegheny Co.				
W. J. Schmidt,	Gibsonia,	Upper productive coal measures.	Gentle slope,	Dark brown sandy loam, sub-soil similar,	P. N.
	Berks Co.				
C. B. Bashore,	Bethel,		Level upland,	Gravel, surface and sub-soil,	K.
H. E. Plank,	Joanna,	Mesozoic,	Gentle slope,	Sandy loam over clay loam,	P, K.
	Bedford Co.				
A. McDaniel,	Everett,	Catskill and sandstone,	Gentle slope,	Red sandy loam with shale, soil and sub-soil.	P, N.
	Bradford Co.				
J. Curren,	Gillett,	Chemung,	Gentle slope,	Shaley clay loam, soil and sub-soil,	K, N.
E. H. Whipple,	Skinner's Eddy,	Chemung,	Level upland,	Clay loam, soil and sub-soil,	K, N.
W. M. Foster,	Canton,	Chemung,	Flat bottom land,	Clay loam over yellow clay,	P, K, N.
	Bucks Co.				
J. C. Betts,	New Hope,	Mesozoic,	Steep rolling valley land,	Clay loam over clay,	P.
H. M. Freed,	Richlandtown,	Mesozoic,	Level upland,	Gravel over clay,	K, N.
	Carbon Co.				
R. A. Eroh,	Weatherly,	Mauch Chunk red shale,	Level upland,	Clay loam over clay,	P, K.
H. H. Sloat,	Rockport,	Mauch Chunk red shale,		Gravelly sand loam over clay loam,	N.
	Clarion Co.				
W. J. Cowan,	Corsica,	Pottsville conglomerate,	Gentle slope,	Gravel, soil and sub-soil,	P, K.
L. Denslinger,	Marble,	Pottsville conglomerate,	Rolling,	Gravelly clay loam over clay,	N.
H. Tippery,	Callensburg,	Pocono sandstone,	Rolling,	Sandy loam over gravel,	K, N.
	Clearfield Co.				
M. T. Smith,	Penfield,	Pottsville conglomerate,	Gentle slope,	Coarse sandy loam over clay loam,	P, K, N.
	Crawford Co.				
F. Anderson,	Geneva,	Pocono sandstone,	Gentle slope,	Clay loam over clay,	P, N.
E. F. Lawrence,	Conneautville,	Catskill or sand oil group,		Sandy loam over slate,	P (?), K, N.
	Dauphin Co.				
A. W. Steinruck,	Middletown,	New red sandstone,	Level upland,	Sandy loam over porous clay,	P.
	Erie Co.				
B. R. Young,	Girard,	Girard slate,		Gravel over clay loam,	P.
	Lancaster Co.				
E. H. Hess,	Windom,	(a) Mesozoic sandstone, (b) Limestone,		Loam over clay loam, Loam over clay,	K. K, N.
J. R. Bricker,	Lititz,	Trenton Limestone,		Hagerstown loam,	N.

Experimenter.	Geographical Location.	Geological Formation.	Topography.	Soil Texture.	Nutrient Deficient.*
	Lehigh Co.				
J. Backenstoe,	Emaus,	Trenton Limestone,	Level upland,	Sandy loam over clay loam,	K, N.
	Lycoming Co.				
H. E. Warner,	Pennsdale,	Devonian,	Level upland,	Clay loam,	P, N.
P. W. White,	Cogan Station,	Hudson red shale,	Gentle slope,	Clay loam,	P, K.
	McKean Co.				
M. Ingalsby,	Custer City,		Gentle slope,	Shaly clay loam,	P (?), K, N.
	Mercer Co.				
J. P. Barbor,	Grove City,	Pardee coal bed (?),	Rolling valley,	Sandy loam over gravelly sub-soil,	P, K, N.
	Monroe Co.				
M. D. Bush,	Gilbert,	Hamilton shale,	Gentle slope,	Black slate,	P, K, N.
	Montgomery Co.				
J. Werner,	Royer's Ford,	Mesozoic,	Sloping upland,	Sandy loam over clay,	P, K, N.
	Northampton Co.				
A. H. Ettinger,	Mt. Bethel,	Limestone,	Gentle slope,	Clay,	K, N.
Wm. H. Kressler,	Mt. Bethel,		Gentle slope,	Sandy loam over clay,	P, K.
	Perry Co.				
F. M. Shade,	Markelville,	Chemung,	Hill-top,	Slate over slaty clay loam,	P.
L. R. McMillen,	Loysville,	Lewistown limestone,	Gentle slope,	Gravelly loam,	P (?), K.
	Potter Co.				
R. F. Martin,	Wharton,	Pocono sandstone,	Gentle slope,	Rocky gravel over sandy loam,	K, N.
	Susquehanna Co.				
H. S. Chamberlin,	Gibson,		Gentle slope,	Strong limestone,	K, N.
A. C. Lowe,	Elk Lake,	Catskill,	Gentle slope,	Strong limestone,	P, N.
W. E. Burden,	Uniondale,	Catskill,	Side-hill,	Red shale,	K, N.
	Tioga Co.				
H. J. Flick,	Morris,	Pocono sandstone,	Level upland,	Clay loam over clay,	P, K, N.
A. L. Tipple,	Wellsboro,	Chemung,	Sloping upland,	Clay loam over clay,	P (?), K, N.
	Venango Co.				
J. E. Williams,	Cochranton,	Conglomerate,	Gentle slope,	Gravelly clay,	P (?), K, N.
	Westmoreland Co.				
G. M. Shaffer,	Mt. Pleasant,	Pocono sandstone,	Hill-top,	Clay,	N.
W. J. Monroe,	Greensburg,	Conglomerate,	Gentle slope,	Sandy gravel,	P, K, N.

	Wyoming Co.				
E. C. Frear,	Lake Winola,	Catskill,	Level upland,	Clay loam over clay hardpan,	P, K, N.
M. C. Keeney,	Laceyville,	Chemung,	River bottom,	Clay loam,	K.

P. Phosphoric acid.
K. Potash.
N. Nitrogen.
P. (?). Unfertilized plots omitted from experiment, so that the effect of the phosphoric acid could not be judged.

Let me caution you, however, not to dwell too heavily upon the results here presented.

The productiveness of a given soil in a particular locality is largely determined by the state of availability of the more important plant nutrients. These states of availability depend in part upon the original character of the soil, but are also in very large measure determined by the methods of culture, systems of rotation and fertilizer treatment used on the farm. For this reason methods intended to determine the present condition of soils afford results which are probably less generally applicable to the whole region in which the soil type prevails, and where the same topographical positions are involved, than do the results obtained by methods which aim to determine the permanent agricultural resources of the land. It is hoped that the fragmentary data above presented may be of some use in your work as agricultural instructors in the several districts of the State. It is also my hope that the foregoing talk may make more clear to you the present condition of soil chemistry, and impress upon you the desirability of a careful survey of Pennsylvania soils with respect to their chemical as well as to their physical properties.

WHERE CROP YIELDS ARE CURTAILED BY LACK OF PHOSPHORIC ACID AND LIME IN THE SOIL.

By Mr. Alva Agee, *State College, Pa.*

The subject of soil productivity interests every land owner. In the cases of the vast majority of land owners the producing power of the farm determines for each one the amount of his income, his freedom from financial burden and his ability to surround his family with the comforts and luxuries that every man desires to give to his loved ones. In agriculture the vital problem is the maintenance and increase of soil fertility.

There are a few striking facts in our agriculture today that bear on this problem, and that are within the knowledge of all observing farmers, and it seems to me an amazing thing that some of us have not appreciated their relation to each other, and have not learned the practical lesson that they teach. I desire to state some of these facts which stand isolated in the view of many, and then to draw the conclusions that cannot be escaped. While ultra-scientific men may issue bulletins denying the principles in soil fertility that once were regarded as elementary, and while there are doubts, confusion and lack of knowledge that cause many a scientist to guard his words with the extremest care when dealing with the seemingly simplest phases of the problem of making soils rich, there are some farm practices that bring the answer in the field regardless of all academic proof that the practices are credited with results they do not produce.

Recently I made a trip through the far-famed blue grass section of Kentucky. That land has given wealth to its owners. It produces a peculiarly nutritious blue grass, and it is highly productive in grain and clover. The soil was formed in part by the disintegration of the rock of the region, which is a limestone carrying a comparatively heavy percentage of phosphorus. The owners of this land are not skilled above others in the science of soil improvement, and their prosperity would not be in such pleasing evidence before the visitor if nature had built their soil out of the kinds of disintegrated rock that furnished the material for an immense portion of our farm lands. In this blue grass land of Kentucky are lime and phosphoric acid in rich abundance. In respect to other elements of plant food this land has no advantage over most farming sections. There is little danger of erring in our thinking when we associate the famous productivity of this blue grass region with the dominating soil-building material of the region—a phosphate limestone. Leaving this isolated fact for the present, let us present another:

It is the common practice among farmers throughout our country to use commercial fertilizers that are high in phosphoric acid. The use of commercial fertilizers is comparatively recent, and the vast sum of money expended for them has come out of the pockets of a class of men who naturally are conservative in expenditure of money. The universal tendency on the part of farmers to use many times more pounds of phosphoric acid than of potash and of nitrogen, taking the fertilizers used in the aggregate, is explicable only upon the assumption that phosphoric acid has been found peculiarly effective when added to the soil store of plant food. The practice of farmers bears out the statements of soil analysts that nature was stingy with her phosphoric acid when making most soils, and it bears out the data of our scientists who are engaged in plot experiments with fertilizers on our old lands. Most soils that interest you and me have a known deficiency in available phosphoric acid. This is a generalization from such full data that we can hardly err in accepting it.

The third isolated fact within our knowledge that I present is this: A limestone soil is presumed by a stranger to be a rich soil, and the presumption rarely is at fault. The timber proclaims the natural strength of the land, the sods are a pleasure to the eye and the homes bear evidence that the people have "a goodly heritage." Poor farm practice may have reduced the productiveness of the land to a comparatively low ebb, but it takes strictly bad farming to accomplish this when a good limestone furnished the basis of a soil. Very many limestone soils show by analysis no greater supply of the elements of plant food other than lime do soils of other origin, but the need of fertilization is slower of approach because the presence of an abundance of carbonate of lime serves, both directly and indirectly, in letting a soil make the very best of its natural strength. For the ways in which this is accomplished I must refer you to the scientists, and specially commend to you Dr. Hilgard's late book on "Soils." It is an old saying that a limestone country is a rich country, and the saying is based upon experience.

A fourth fact, and one wholly disconnected in the thinking of many land owners, is that clover grows less luxuriantly upon a vast number of farms in our Eastern states than it did formerly, and in large areas it has nearly ceased to grow at all. This is a most serious matter. The legumes are our cheapest dependence for nitrogen, a costly essential element of plant food when purchased outright, and one that is very apt to be limiting crop yields by its scarcity. Then, too, the clovers are specially valuable in furnishing organic matter that aids in freeing inert material in the soil and conserving moisture. Good tilth and resultant productiveness are dependent upon organic matter in the soil, and the legumes are invaluable. These clover failures, excepting the ones in occasional years that are due to insect depredations or disease, are confined chiefly to these very large areas of our country in which the soils contain a low percentage of lime. We find an exception in the case of some soils once fairly rich in lime, whose supply of soluble lime has leaked out and left them distinctly acid. The prevalence of soil acidity in the lands outside of the limestone areas is amazing, and there is reason to believe that these areas increase as land grows older. The litmus paper test, and especially in the hands of the inexperienced, may rightly be discredited by scientists, but in Ohio, where laboratory tests numbered by hundreds have shown that soil acidity is widespread in the state, it is a fact that an actual lime requirement often is found in a soil that does not show evidence of acidity by the litmus paper test, and I believe reports from farmers would show that this test rarely, if ever, has led to applications of lime where they were not beneficial. Soil acidity, due to a lack of a base to unite with free acids in the soil, is widespread outside of true limestone belts of land, and this acidity is hostile to clover, and limits most crop yields directly and indirectly.

Let us restate our four seemingly isolated facts tersely:

1. A region like the blue grass section of Kentucky, whose soil owes its peculiar excellence to a limestone rich in phosphorus, bears evidence of special favors from nature's hand.
2. Scientists and farmers secure more marked results, as a rule, from applications of phosphoric acid than from any other one element. Nature's store of this element in the land usually is limited in amount and often tightly held.
3. A limestone country is a rich country.
4. Soil acidity is very prevalent outside of limestone areas, and it is limiting the production of clover and, directly or indirectly, of all other crops.

Dr. Hilgard, than whom I know no more competent authority upon the subject of "soils,' terms carbonate of lime—pulverized limestone—"a dominant factor" in soil productiveness. It improves tilth conditions, neutralizes acids, favors clover, renders phosphoric acid and potash available, directly or indirectly, and promotes the conversion of vegetable matter into humus. He finds that "lower percentages of potash, phosphoric acid and nitrogen are adequate when a large proportion of lime carbonate is present." Now, if we take this statement in connection with our second fact that phosphoric acid is the limiting element of plant food in immense areas of our eastern land, we may see how peculiarly blessed is that region whose soil comes from a phosphatic limestone. It has the phosphoric acid, it has the lime to favor bacterial action and promote clover growth so that nitrogen easily is secured, and humus-making material can be plentiful, and then there need be no concern, unless it be about potash. Nature has done nearly all that is possible for it.

But a limestone country is a rich country, even when that limestone is not rich in phosphorus, and practically all our limestone in the north is not. The country still is rich, because the soil conditions are favorable to the grasses and the legumes, insuring organic matter and nitrogen, and they favor the conversion of fertility into assimilable forms for use of the plants. It becomes necessary in time to apply phosphoric acid, but full returns are got from the application. Soil conditions are healthy.

I have brought these facts together to no purpose if I have not the way paved for intelligent consideration of the needs of the land outside of our limited limestone areas and other areas disinctly calcareous. I have personally met thousands of farmers whose land is making no increase in productiveness, and I know immense areas that are losing in productiveness, and the owners find the outlook disheartening. Clover has ceased to be a sure dependence, and crop yields are closely limited by the soil conditions. The experience of the Ohio Experiment Station in various parts of its state, the experience of the Illinois station on many test farms in Southern Illinois, where crop production has fallen off badly in late years, and the experience of a large number of farmers scattered over the territory reached by the National Stockman and Farmer justify the broad claim that when land which once was productive is failing to make good clover and grass sods and good yields of grain, the owner should look at once to that land's supplies of carbonate of lime and phosphate of lime. These are the first consideration, and usually in the case of clayey lands the only primary considerations. Analyses of these discouraging and disheartening soils may be expected to show that the content of lime is below the limit of safety, and thus are soil conditions made unfriendly.

The betterment of these unsatisfactory soils may then, in all probability, be secured by giving to them some of the advantages of a limestone soil through the application of carbonate of lime to them. How much of this material, in the form of pulverized limestone, may be applied with profit? This is a question that can be answered only by experiment. Our Wooster station land contained 26-100 of 1 per cent. of carbonate of lime. Assuming that one acre of this land, one foot in depth, weighs 1,750 tons, the amount of carbonate of lime in this surface soil was four and a half tons, and here the land was so unfriendly to clover that failure followed failure for a series of years.

Dr. Hilgard believes that it is necessary to raise the lime carbonate content of a heavy clay soil of 60-100 of 1 per cent. to give it the advantages of calcareous soil, while 20-100 of 1 per cent. may serve a sandy soil. As our Wooster soil is not of the heaviest type, let us assume that 50-100 of 1 per cent. is right. This would require an application of four and a half tons of ground limestone, or its equivalent, in two and a half tons of caustic lime. Experience has shown on this land, however, that one ton of caustic lime, or two tons of ground limestone, gives remarkable results. The clover is good, and the grain crop has increased as a result of the friendly conditions created in the soil. It is believed by Director Thorne that an increase in the content of lime carbonate will give still better results, and the experiments are under way, but there is encouragement in the fact that any increase in the lime content is attended by an improvement in soil conditions. The clover problem has been solved for this Wooster station soil.

There has been discussion concerning the form of lime that should be used. Beyond doubt finely pulverized limestone is superior to caustic lime, because it can be used without any danger of harm to the land. It does not liberate the soil nitrogen in the form of ammonia, as does caustic lime, but assists in its retention. We have three scientists whose work is pre-eminent in calling public attention to the wide need of soil acidity correction. I refer to Dr. Hilgard, to Dr. Hopkins, who is demonstrating the way to restore the infertile lands of Southern Illinois by correction of its acidity and restoration of the supply of phosphoric acid, and to Director Thorne, of Ohio, who is doing a great work for Ohio, and these three gentlemen believe that the carbonate of lime—pulverized limestone—is preferable to caustic lime. It is true, however, that caustic lime, in moderation, is used with admirable results, and is to be advised when this form of lime is cheaper, or for other reasons more available, than the pulverized carbonate.

While lime is a dominant factor in soil productiveness, it is evident from such data that crop yields throughout our country are limited by the deficiency of phosphoric acid in the land. It is a condition so nearly universal with us that the purchase of this plant food for our fields rarely is unwise. Desirable as steamed animal bone and basic slag are known to be as carriers of phosphoric acid, it is idle to recommend their sole use, because they are in insufficient supply upon the market. The chief source of phosphoric acid for land must be the phosphatic rock. This is our great storehouse of this plant food, and the use is imperative. There is objection to the use of acid phosphate on lands having a low lime content, and this objection is well based upon the experience of many farmers and the careful experiments of the Ohio station. Where the content of carbonate of lime in the Wooster soil naturally was only four and a half tons in the surface foot of an acre of land, the continued use of acid phosphates increased the difficulty of getting growths of clover. This objection is not vital, however, since we know the practicability of correcting this condition by supplying lime.

Another objection to the use of acid phosphates is the addition to the cost of the plant food due to the treatment of the rock with sulphuric acid. At the Wooster station a pound of phosphoric acid in an acid phosphate—the rock treated with sulphuric acid—costs three times as much as a pound of acid phosphate in the raw, or untreated rock. The desirability of full supplies of phosphoric acid in all farm land renders this difference in price a very important point. If the acids resulting from the decay of organic matter could be made to take the place of the sulphuric acid, there would be an immense saving in money to the farmers, a saving from injury to soils that are naturally not rich in lime, and there would be a resulting impetus given to the free use of phosphoric acid upon land that would be reflected in larger crop yields.

Important work along this line is being done by Director Thorne, of the Ohio station, and Dr. Hopkins, of the Illinois station. The experiments at the Ohio station were begun ten years ago, and are concerned with the effectiveness of the plant food in the raw phosphatic rock when mixed with stable manure. As measured in crop yields, the phosphoric acid in the raw rock has brought returns showing about the same net profit from the application as is shown from the application of acid phosphate by its side, and the ill result from use of acid phosphate on this acid soil is escaped. An increase in net profit from the crops, due to the smaller cost of the phosphoric acid in the raw rock, has not appeared in this experiment. Some data from experiments elsewhere are more favorable to the raw rock phosphates.

In Illinois the effects of the applications of the raw rock are so marked that Dr. Hopkins urges its use to the exclusion of acid phosphates. He is using it freely upon his own farm, purchased a few years ago in Southern Illinois, where land prices are very low on account of the low state of productivity to which that whole section has fallen, and he is using it on many test farms over the state. His results with raw phosphatic rock and ground limestone lead him to believe that the infertile southern third of his state will be brought back to a high state of production through their use, and the clover that follows their use. The rock is broadcasted on a sod or other green crop, and is plowed down, it being important that the raw rock be intimately mixed with the decaying vegetation.

Where organic matter is lacking, and where phosphoric acid is wanted in an immediately available form for a crop, it is advisable to continue our present use of acid phosphates, steamed bone or basic slag. The essential thing is that phosphoric acid be given to our hungry soils, and any carrier is good that brings results.

Our country has a wide variety of soils, but, exclusive of the leachy sands that are deficient in all elements of plant food, and the limited muck area, the great areas of farm lands east of the Mississippi, whose productiveness is distinctly unsatisfactory, should be subjected by their owners to tests with lime and phosphoric acid used with a free hand. Our calcareous soils, except where they have been subjected to a skinning process, are not within these disappointing areas. It is, as a rule, the land with low lime content that has presented the puzzling problem. When this dominant factor in soil productiveness has been supplied, then should the deficiency in phosphoric acid be made good, and that deficiency exists inside of most limestone areas as well as outside, if cropping has been hard. With a full supply of carbonate of lime and phosphate of lime, the clovers usually are assured, and they furnish both the nitrogen and the organic matter that is essential to continued crop productiveness. The supplies of inert potash in most clay soils is so large that they may be largely depended upon wherever the supply of rotting organic matter is abundant, as it should become after the applications of lime and phosphoric acid. Sands and muck soils are less rich in potash.

Full practical recognition of the possibility of giving land outside of the limestone areas some of the advantages of a calcareous soil by applications of ground limestone, and full practical recognition of the deficiency of phosphoric acid in most old farm lands, would restore heavy clover growths to the farms, rich humus to the soils and new heart to the owners. It is the biggest consideration today in eastern agriculture.

MODERN TREATMENT OF THE APPLE ORCHARD.

By Prof. J. P. Stewart, *State College, Pa.*

Mr. Chairman, Ladies and Gentlemen: I am sorry that Professor Butz is not here to present this subject to you, both because I had to take it up on short notice, and because I am a new man in the State, and can only give you impressions. But there is one comforting thing about it, these impressions are all contained on this small piece of paper.

In the first place, there are many things that we don't know about apple orcharding. There are some things that we do know, and a good number that we thought we knew, but are just coming to find out how little we really do know about them. I am sorry that I am unable to make this topic more of a crystallization of opinion for the benefit of Institute workers. It is just possible that my discussion will cloud instead of clear the horizon. I shall try, however, to say nothing but what seems at present to be the truth in the matter, and I believe that the truth will not hurt us.

One of the things that we know is that the apple is very largely planted; that it takes first rank among fruits in America, both in the number of trees and the number of bushels. We also know that the financial returns are very good where apple orcharding is being followed as a business. In Western New York two hundred dollars per acre is not an unusual return, and, from all appearances, we have localities here in Pennsylvania which are fully equal to Western New York. Yet I have seen within the last two days hundreds of acres of such soil still being farmed in the ordinary grain crops, where they are yielding such small returns that the owners are willing to take $50 to $60 per acre for the land. Surely one of the best things we can do for Pennsylvania agriculture is to direct effort into more profitable lines.

Pennsylvania is probably as well adapted for apple culture as any other state in America. The reasons for that are simply three: First, its location with reference to markets. We are within easy reach of all the large fruit centers, besides having unrivaled home markets in the many mining and manufacturing towns. Second, the climate and soil are right. The successful experience in the states on all sides of us show this; and, third, the succes of home orchards in this State, which in 1899 placed Pennsylvania second in yield of apples. Yet, in spite of all this, apple orcharding is not taken up as extensively as it should be. The owners of apple orchards feel that they have so many enemies to contend with and so long to wait for a crop. There is the root rot, the borers, the scab, the codling moth, the curculio, the scale, and unfortunately one or two others that I have recently found, but cannot name, because there has been nothing published on them. We admit that these things are likely to give a man the belief that apple orcharding is rather risky. But we are not intending to give up on that account, and with the right kind of men—men not afraid to work and learn and wait, the outcome will take care of itself.

Turning to some of the things we thought we knew, this fertilizer problem that has been so puzzling along other lines of agriculture is even worse when it comes to orcharding. There are a good many things we thought we knew in regard to it. For example, we have always believed that potash was the thing needed for fruits, but in the Geneva Experiment Station they have been conducting a series of experiments on this for twelve years. They put wood ashes on at the rate of two hundred pounds per year of actual potash to the acre. They got as a result in a five-acre field in twelve years a total increase of $53.25, less than $1 per acre per year. This would not pay for putting on the potash, to say nothing of paying for it. Similarly in England, where some excellent experiments have been carried on, the same thing holds true. In one of their experiments they found that the use of potash was actually harmful instead of beneficial. This does not mean, however, that we should not use potash in apple orchards—far from it. It simply means that this English soil, and the soil at Geneva, already contain enough potash. To add potash there is of no value. It is like "carrying coals to Newcastle." It may be the same way here in Pennsylvania. At any rate, it is part of our business to find out.

In reference to the nitrogen question, we have always supposed that nitrogen was the wrong thing to use in orchards. That is true in New Jersey, in the case of the peach, where experiments have proved that it has a disastrous effect on the crop. However, in the English experiments that I mentioned, nitrogen was the only fertilizer that produced results of any kind. This simply shows how contradictory the results are, how impossible it is to generalize on the basis of present knowledge, and that orcharding is essentially a local problem.

Then we look at the question of phosphorus. In New Jersey we find that phosphorus gives the best results of anything they applied, while in West Virginia they found acid phosphate fatal. So it goes. The experience in one place is only suggestive for another. When it comes to methods, the situation is scarcely better.

We have supposed that the only successful method in orchard culture was tillage with a cover crop, or possibly straight tillage. Many of us have supposed that grass was the most harmful thing we could put into our orchards. The English experiment shows that grass was worse than any other treatment. The growth on the grass plots was only about one-eighth that on the tillage. On the other hand, if we look at the results in Ohio, which cover a period of six years, they show that the growth was better, and that the yield in the grass-mulched plots was practically double that in any other.

Then the matter of selection. Science has taught us that in improving plants we should utilize the principle of plant selection. In fruits we find cases where this holds true, but, at the same time, there are cases where it doesn't. I have a man here in Pennsylvania who has tried selection under as favorable conditions, I suspect, as one could ever hope to find. The man has never published anything about it, and I never suspected it when I went to visit him, and found he had tried it. He had, in four rows of Salway peaches, one tree that was very much better than the others. He concluded that he should like all of his Salways to be like those of the one tree. He took buds, many of them from that tree, and had them prepared as usual and planted in an adjoining field. The result was that not a single one of there trees came true to his excellent Salway peach. They were the same old kind of Salway which he had attempted to improve. That is simply one set of results. We have records on the other side. But it shows the unreliability of our present knowledge along this important line, and emphasizes the fact that we cannot yet safely generalize in many branches of horticulture.

But, you say, what is the orchardist to do? He is at a loss as to what is the proper soil, the proper fertilizer, the best culture, nor does he know much about the influence of selection. Yet his very existence depends upon the correctness of his methods. How shall he find what correct methods are? First and foremost, the successful orchardist must be an experimenter in the true sense. If our present horticulture knowledge is convincing on any one thing, it is this—that the orchard itself is the ony safe source of information concerning itself. Experience elsewhere is valuable as suggesting what one may expect in his orchard; but most methods should be first tried on a small scale to determine their probable effect before adopting them, widely under new conditions. This procedure properly followed out cannot fail to lead to success, and constitutes what we mean by "experimenting in the true sense." To make it clearer, let us look at the other type of experiments. Some people think they are experimenting when they are trying a given plant food or fertilizer over a whole field, and then looking for results the first year. If, perchance, they get a good yield, they attribute it all to the fertilizer. They laud it to the skies, and recommend it to all their friends as the only proper thing to use, regardless of soil or other conditions. If they don't get results at once, they condemn it. How do they know that it was not the season that made the good showing? How do they know that it was the fertilizer which gave them results? How can they expect to judge on a basis of so short a time? That is not experimenting in any sense. The orchardist must become an experimenter in the true sense. It is his only salvation, and it will benefit him as well as his orchard.

Now, in the light of what I have said so far, it is practically impossible—it is entirely impossible—to outline a reliable general method of orchard treatment. One might say a good many things about the best method, and then find it not the best method for any particular locality. This is the very cause of many of our failures. A man is induced to adopt and hold ill-suited methods and varieties because they have succeeded with some one else. Modern treatment of an apple orchard is the experimental treatment, and the wise orchardist will pin his faith to none other. To make this still clearer, I wish to read the following quotation: "Where a grower wishes to lay down his fruit plantation to grass, it would be very easy, in most cases, for him to lay down a portion of it only, in the first place, and ascertain what the effect on his trees is, and whether it would be advisable or not for him to treat his whole plantation in a similar way.

"Such simple experiments or trials are not beyond the means or capacity of any fruit grower of average ability, and the marvel is that they are so rarely made, and that one whose existence depends upon the correctness of their practice should not adopt the most practical of all methods of obtaining the knowledge they require—that of ascertaining for themselves by direct triai what treatment of their crops is the best. Special training, no doubt, is necessary for the execution of elaborate experiments, and special knowledge is necessary to know how far the results can be generalized, so as to be applicable to other land and circumstances; but the case is quite different when a grower has only to ascertain what succeeds best on his own land. Perhaps the oft-repeated and more often mistaken cry of antagonism between theory and practice is the reason why growers are so prejudiced against experiments, mistaking experiment for theory, and the blind observation of tradition for practice. The spirit of investigation, when properly conducted, can never fail to advantage the investigators, and if this spirit could but be developed amongst fruit growers we would soon have a mass of observation, which, when properly digested, would be of incalculable benefit to the whole industry."

This was written by one who had experimented for ten years, only to get disappointing results. But negative results are sometimes as valuable practically as positive ones, and he was going ahead undaunted.

Now, you may question whether this experimenting can be done. There is no doubt about it; much of it is being done already. It is surprising, when one gets over this State, to find how many of these things are being done in a way by the men in the orchards. The man with the Salway peach, of whom I have told you, is an illustration of this class of men. He has set aside a part of his orchard and is experimenting with the different methods, asking his orchard which is the best. It will tell in time, and its answer will be undoubtedly correct for that orchard. Unfortunately, in planning his experiment, he overlooked the one factor that will cloud his results. He is on the right track, but needs help. That is what the Experiment Station is proposing to give. Let us know what your problems are and we shall try to offer solutions, or to help plan experiments that will solve them. In our work at the State College we are now undertaking a longer and more difficult experiment than is usual among experimenters. Its object is to study the fundamentals of apple culture. I can give you some idea of it by means of this chart.

The first two charts illustrate the fertilizer test. It covers four to eight acres, and involves ten treatments and six checks. This experiment is expected to show us what fertilizers are needed in a given soil, and the effect of the different plant foods on the trees and fruit, so that later we may be able to determine the needs of a tree by its appearance. We already know that orchards demand considerable amounts of plant food. For example, if we can rely on the chemical analyses that have been made, an acre of bearing apple orchard requires about:

51.5	lbs. nitrogen.
14	lbs. phosphorus.
55	lbs. potash.
57	lbs. lime.
23	lbs. magnesia.

It is interesting to note the large amounts of lime and magnesia that are required, and yet we hear very little of these in connection with orchard fertilizing.

Looking more into the details, in these two blocks we put potash, in one of the muriate, and the other the sulphate. This is done because we do not know but that there may be something in the form in which potash is applied. Brooks, of Massachusetts, got very little benefit of muriate of potash, but got the greatest benefit when he put on phosphorus, plus potash, as a sulphate. In these next blocks we put on phosphate, both in the acid form and in the raw rock. We generally consider the acid form to be preferable. It is impossible, however, that there are some conditions in which the raw form will be just as good—perhaps better. The apple orchard doesn't require the immediate availability demanded by annual plants. If it doesn't get the plant food one year, it will still have a chance at it the next. Also, in soils rich in iron the acid phosphate is likely to revert to an iron compound, which is less soluble than the original raw rock. Under these conditions the latter may be preferable. If it is, it will come out in the experiment. Turning to the village experiment, it is being conducted on eight acres, and involves the four principal cultural methods in common use. We believe that no man who is in the orchard business can afford to go on putting things into the soil, and following methods that he has not proved to be of value to him; and we believe there is no better way of determining what he should do than by setting off a part of his planting and fairly trying the different treatments and methods. Try them on a small area, and then accept or reject them, as the case warrants.

Here is a chart showing pruning tests. We all know the man who, with no knowledge of orcharding and less of pruning, always has a fine crop of apples—a much better crop than his neighbor, who follows better methods. There is no apparent reason; he confidentially tells you that it is all in the man. We believe it is something else. We want to find out what there is in this question of pruning, how much of it is necessary, and what form of pruning is best; whether headed and pruned lightly, or headed and pruned heavily, to vase form, or headed and pruned heavily to sphere form, as they do very successfully in West Virginia. On the time of pruning, we have divided our tests into spring pruning, before blossoming; summer pruning, avoiding auxiliary branching; fall or winter pruning, root pruning and girdling. The latter is used successfully in some places, but we do not recommend it. Occasionally, where the tree is going to wood, it might be possible to make some practical use of girdling, and if the girdle is put on the tree in the right place, it is probably safe; but to girdle limbs and miscellaneous places is likely to be dangerous to the life of the tree.

In parts of Arkansas they have practiced girdling the tree with as much as one inch girdle every year for the past three years, with good results in crops and no apparent ill effects on the trees.

In conclusion, I will summarize briefly. Apple orcharding should be most profitable in Pennsylvania, because of natural advantages and the convenience of general and home markets.

In no other way can we render greater assistance to Pennsylvania agriculture than in directing it into the most profitable lines. Present horticultural results indicate clearly that orcharding is largely a local problem. Hence the successful orchardist must be an experimenter in the true sense, and a student of local conditions.

The Department of Horticulture at State College is already at work experimenting on the fundamentals of apple culture, and is ready to help men in planning, carrying out and interpreting experiments bearing on the improvement of the apple industry.

THE PEACH: HOW TO RAISE AND MARKET.

BY DR. J. H. FUNK, *Boyertown, Pa.*

The subject allotted me is one of such vast importance, and so difficult to handle, that it is with diffidence I stand before this intelligent audience and give methods of raising and marketing this fruit commercially. Of all our fruits, there are none that are more susceptible to sudden changes, to climatic conditions, to variations of soil, fertilizers, cultural methods, etc., than the peach.

HISTORY.

It is only within recent years that the peach has been raised commercially outside a prescribed area. It was formerly thought that Delaware, Maryland and New Jersey comprised the entire peach belt; but it has gradually widened until there is now scarcely any section throughout the southern, middle and northeastern, as well as the western and southwestern portions of the United States, that cannot, and does not grow this delicious fruit in its highest state of perfection for home use and commercially. In fact, these states, that once held the honor of being the great peach states, produce at the present time a very small proportion of the millions of baskets consumed annually in our large cities.

Peaches were raised commercially in the United States more than a century ago. It is quoted in a bulletin issued by one of the states that peach raising in Delaware dated back to 1832, when the first orchard was set in Delaware City. But this is an error, as peaches were raised commercially in Kent county, Delaware, previous to 1807. At that early date orchards of fifty to seventy acres were planted, and the industry was carried on extensively many years previous to this.

In the Memoirs of the Philadelphia Society of Agriculture, which was formed in the year 1785, in Volume I, published in the year 1815, on page 188, there is a communication from Richard Peters to Dr. James Mease, Secretary of the Association, giving an account of their methods of raising peaches. From these writings we find these pioneers in peach raising were as far advanced as the majority of the present generation in the raising of peaches and the method of peach culture.

In this communication it states, the more sandy the soil, the better the fruit; nor should it be overrich. Peach orchards are planted to ameliorate poor lands. The disease called yellows was also prevalent at that early date, and not, as many suppose, of more recent origin. In reference to this he says: "The yellows are universally prevalent this season throughout the whole country. I do not wish to discourage perseverance in the culture of this tree; but when particular products fail they warn us to apply our main strength and resources to other objects more certain and equally profitable. Let hazardous cultivation be collateral and subordinate."

Even hoodoo doctors were around in those days to entrap the unwary is shown where he states: "The mercury is mentioned by Dr. Tilton for the cure of the disease in peach trees. I have frequently applied it to plums. I bored a gimlet through the bark, and about a half-inch into the sapwood, and inserted a drop or two of crude mercury, so as to be carried through the circulation, with intent to destroy vermin or insects in the bark or fruit. I have sometimes had plenteous crops, apparently from the remedy; but I have more often been disappointed."

TYPES.

There are five distinct races of peaches cultivated in the United States: The Persian, Northern Chinese, Southern Chinese, Spanish and Peen-to. The geographical names representing the parts of the world in which each race is supposed to have originated, or to have reached its highest development. The geographical name is objectionable, for it is probable that all types of peaches originally came from some part of China.

We have no definite information concerning the number, the origin or the distribution of the types in their native homes. It is therefore not proper to apply geographical names to a distinct type or group before something is known about them in the country in which they belong.

SELECTION OF TYPES.

The selection of types or varieties of types is a very important matter with the prospective fruit raiser. Upon this selection depends to a large extent his success or failure. There are many climatic conditions existing in the United States, and the selection must be made according to the section of the country where the orchard is to be planted. In semi-tropical sections, as in Florida, the Peen-to type and their many crosses are peculiarly adapted; being extremely early, they mature their fruit long before the other types, therefore, commanding remunerative prices; but they are very susceptible to cold, and will not stand even light freezing, so it would be folly to plant such varieties in any part of Pennsylvania, or states of similar latitude. We must have hardy varieties, such as will withstand severe freezing, several degrees below zero.

What type shall we select from? There are some varieties of the Persian type that are fairly hardy, and will stand ordinary winters if properly treated; but we must look elsewhere if we wish safety. In extraordinary cold winters we must have varieties that can withstand 15 or 20 degrees below zero. Are there such? As the ordinary orchards are treated, there are not. If the previous year's culture has been of the proper kind, then we can safely say yes, as we have on more than one occasion passed through winters when the thermometer registered 10 to 15 degrees below zero, and had bountiful crops. We also had open blossoms and young fruit frozen solid without injury, when all surrounding orchards had the prospective crop destroyed, in some instances even the wood being killed. The hardiest type are the North Chinese cling type, or group, and varieties from this group are the safest to select.

The question may arise, Have we a sufficient number of varieties from this group to fill the season from early to late? The planter generally selects too many varieties, thereby getting too large a proportion that are not profitable. From my observation and experience, I find that the larger proportion of the catalogued varieties had better be let alone. It is well to test new and promising varieties, but do not plant extensively of any variety until it has earned a reputation; and it should be borne in mind that a variety that is profitable in Delaware may be of little worth in another state, as the environments modify the variety, and each one needs to be thoroughly tested under widely varying conditions before its value can be judged.

In giving a list of peaches, a great many of the old varieties will be omitted, not because they are worthless, but because they have served their time, and are superseded by others of more merit.

Varieties which I consider the best for commercial purpose will be given in the order in which they ripen. My list will be short, as there are few dependable money-makers. Those of the North China type will be noted thus (N. C.).

SNEED. (N. C.)

This variety has for several years proved the earliest by one day. It is remarkable for its vigor and low spreading growth, with its very large foliage. It is a very prolific bearer, and unless the fruit is well thinned on the trees it is apt to remain small and lack flavor; but when properly thinned the fruit attains a size about medium; color, greenish white, overlaid with a bright lively red; skin is rather delicate; the fruit must be handled with care; flesh is greenish white, red beneath the skin on the sunny side; juicy, not high flavored or quality; a thorough clingstone. At the Paragon orchards we have for several years commenced picking this variety on the fourth day of July. I would not recommend extensive planting of this variety; but a limited number of trees for a near market are very profitable.

VICTOR. (N. C.)

This variety is later than the Sneed by about one day, but it continues in ripening for a longer period, often requiring a week to ten days or more to mature its crop; but in all other respects it is vastly superior. The tree is a healthy grower, a regular annual bearer, having its fruit evenly distributed over the tree. Fruit is medium in size, roundish, when fully ripe it becomes red over the entire surface; dots small, pink, down short, flesh creamy white, sometimes tinted red, melting, jucy; flavor subacid, with a slight almond flavor; quality very good. This peach is very valuable, not subject to rot; semi-cling.

GREENBORO. (N. C.)

A very valuable second early variety; ripens between the Victor and the Carman. It is very hardy in bud, and seems to do well wherever tested. The tree is a medium grower, rather low and spreading, an early and very heavy bearer, requiring considerable thinning; suitable only for home market, being too tender for distant shipment. The fruit is medium to large; beautiful creamy white, splashed and striped with red; skin rather tender; separates easily; flesh white, tender, juicy, soft; semi-cling. The fruit must be closely watched and picked while firm.

WADDELL. (N. C.)

Tree a vigorous grower, but of a low spreading habit; a young and very prolific bearer, very subject to overbear, requiring very heavy thinning, or the fruit will remain small, but when properly thinned the fruit is of medium size; beautiful creamy white, with a bright red cheek in the sun. Flesh is white, frequently stained with red, juicy, tender; quality very good; semi-cling. A very profitable variety to plant.

CARMAN. (N. C.)

At the Paragon Fruit Farm this variety has proved one of the most valuable. The tree is a very vigorous grower, and a very early and prolific bearer of choicest fancy, high-colored fruit; its earliness, large size and attractive appearance make it very valuable. Fruit creamy white, marbled over one-half with a delicate red; skin firm; flesh white, slightly stained; soft, juicy, fine texture; quality very good; stone semi-cling. Its extreme hardiness and great productiveness make it the anchor of hope to the fruit raiser. Our four-and-one-half-year-old trees produced seven 16-quart baskets the past season per tree, which sold for $1.25 per basket. It is an annual bearer.

EARLY BELLE. (N. C.)

This is the first early freestone on the list, beginning to ripen before the Carman are all ripe. When fully ripe it is the most beautiful peach of the Chinese group. It is an excellent shipper, being highly colored while still solid. It can be picked and shipped long distances, and arrive in good condition. The tree is a good, but not a rampant grower, but makes a large spreading tree; comes into bearing young, and is a regular but not prolific bearer. Fruit above medium in size; color a rich red over a delicate creamy white underground; where fully exposed it becomes red over the entire surface; flavor rich subacid; quality excellent. This variety brings 25 per cent. more money than other varieties of its season, being a favorite with the venders at fruit stands.

CHAMPION. (N. C.)

This is another money-maker. Its hardiness and productiveness render it a never-failing source of profit. I have never known this variety to fail. Its fruit is always so large, so beautiful, of such high quality, that it always commands a ready market at the highest prices. It is the favorite with all lovers of good fruit. As a canning peach it has few equals and no superior, retaining its flavor indefinitely. Fruit is a beautiful creamy white, with a red cheek, sometimes colored over the entire surface. Classed as a freestone, but it adheres slightly for some reasons.

BELLE OF GEORGIA. (N. C.)

This is another grand peach of the North China strain, that stands as one of the leaders as a money-maker. Hardy in tree and in bud. A prolific bearer of the choicest fruit; large in size, beautiful in form and coloring; creamy white, a blush cheek and crimson mottlings at base; flesh white slightly red near the stone; melting, juicy, vinous, and of the highest quality. This variety never fails or deceives you.

FITZGERALD. (N. C.)

This is a yellow peach of high quality, ripening just before Elberta. It is not quite so large, but of much better quality. Good for home market; rather tender for shipping; flesh rich, deep golden yellow, with high character. Would not advise planting largely.

CAPTAIN EDE. (N. C.)

A variety comparatively little known, considering the value of this most excellent peach. It succeeds well wherever tested; the tree is a strong grower, a heavy bearer of uniform-sized fruit; always fair and smooth; no culls; matures its fruit in a short time; is an excellent shipper and a general favorite for home use. For market, for canning or eating out of hand it has few equals. Color lemon yellow, with a red cheek; a perfect freestone; flavor subacid, with slight almond flavor; quality very good; should be planted in every orchard, it is a money maker.

ELBERTA. (N. C.)

One of the best known and most extensively planted peaches of the present time, commercially and for home use. This seems strange, when we consider that we have so many better varieties in every respect. Beauty alone recommends it, for it is not of high quality. It is not as sure as a bearer; it is subject to leaf curl and other kindred diseases. It has never been a favorite at the Paragon orchards, although it has given fair returns. The tree is a good grower, an early and medium heavy bearer; fruit large, highly colored, rich lemon yellow, splashed, marbled and often striped on one side; skin thick, velvety, flesh yellow, firm, juicy; freestone. A good shipper.

MATTHEWS BEAUTY. (N. C.)

Supposed to be a cross between the Elberta and Smock, showing the parentage of both, size large to very large, many specimens weighing 9 to 10 ounces each, 50 or less filling a 16-quart basket. Season immediately after Elberta. This season at the Paragon Orchards the Matthews were a sight to behold, limbs bending to the ground, with hundreds of baskets of the most beautiful colored fruit the size of goose eggs. The skin is a golden yellow, streaked with red, often covered on exposed side; flesh rich yellow, firm, juicy, and of good quality. This variety sold for higher prices than any other, owing to its immense size and great beauty, bringing from $2.00 to $3.00 per half-bushel basket.

FOX SEEDLING.

A very valuable white peach, ripening the latter part of September. The tree is a strong, healthy grower, an early and abundant bearer of beautiful white peaches; skin white with red cheek; flesh melting and sweet; an excellent variety for home use and market.

There are many other excellent varieties, that are profitable in many sections, but space will not permit describing them. The most valuable ones are Reeves, Stump, Old Mixon, Francis, Fords, Mountain Rose, Family Favorite, Niagara, Iron Mountain, Smock and others. Many of these have been tried on the Paragon Fruit Farm, and found wanting, therefore discarded. Some are newer varieties, and are now being tested, but I make it a rule to never recommend a variety until I have tested it myself, and none but the best are good enough for the Paragon Orchards.

PEACHES FOR HOME AND MARKET.

In the production of this luscious fruit there are more failures than in any other. Questions are being asked continually relative to varieties, soil and locations suitable for their culture, the planting, culture and spraying. I will endeavor to give in the most easily available form the A. B. C. principles of peach culture, which seems to be demanded by fruit raisers.

There are certain unfavorable locations where it would be fallacy to attempt to produce peaches of even the most hardy varieties, but I do not believe there are large areas of territory within the boundaries of our State that are considered unfavorable, in which the most hardy varieties will thrive. South of latitude 40, the majority of the varieties given will do well, but for such sections lying farther north, in which rigorous and erratic climatic conditions prevail, the following may be selected: Greenboro, Carman, Champion, Captain Ede, Iron Mountain, Belle of Georgia. This list is short, but it comprises the cream of the list in hardiness and good quality, and they cover the season from early July until October. Let the beginner in unfavorable sections confine himself to this prescribed list for commercial planting, and test other varieties until he is satisfied they are suitable for his locality.

SOIL.

It is generally conceded that soil of a sandy nature, with a clay sub-soil, are best adapted to the peach. Yet we see peaches of the highest quality produced on stiff clay soils that are thoroughly drained, either naturally or artificially. No tree will do well with its roots imbedded in cold, water-soaked earth. The soil should be fertile, with sufficient humus, but not too rich in nitrogen, yet containing an ample supply of available phosphoric acid and potash.

LOCATION.

A cool western or northwestern slope is to be preferred. To a very limited extent such exposures may retard bud development in early spring, thus tiding them over the danger from late frosts, which are so destructive where trees are forced in bloom prematurely. Light, sandy loams upon warm sunny southern slopes should be avoided. A western slope is preferable to a southern one.

This matter of exposure pertains more to very steep hillsides, where there is a marked difference; but in ordinary rolling, sloping hillsides the variation or exposure is not great. On the Paragon Farm, we have every exposure, and have had no failure of a crop from freezing or other causes for many years. More danger lies in lack of knowledge and application of proper culture and fertilizing than aught else; but the hillsides have the preference, because they afford natural drainage of both water and air, both of which are essential to profitable crops.

PREPARATION OF THE SOIL.

Opinions differ; nearly every fruit raiser has some theory that has proved more or less successful, and he has every reason to believe his method is right. I have mine, and yet I know that the majority of fruit raisers will disagree with me, but in some instances the minority can be right, and without entering into scientific reasons, I wish to state that when, for some reason, there is an occasional failure of a crop, we must come to the conclusion that there is something wrong; that something has been done that should not have been done, or that something has been left undone that should have been done. If, on the other hand, by close attention and skillful manipulation, you have obtained successive crops through a long series of years without one single failure, does it not show that you have struck the keynote to success? Does it not show that you have been working in harmony with nature, that you have applied the right thing at the right time, that you have left undone that which has proven injurious to your neighbor? But your neighbor, in his endeavor to shirk responsibility, will claim it was due to natural causes, that the ingenuity of man could not change it; that if frost comes and freezes his crops he could not stop it. This we will admit, but man can, by proper, intelligent methods, store up sufficient vitality in his trees as to render them immune from the effects of freezes that would under ordinary conditions destroy them. Now, our horticultural lights will tell you, if the soil is infertile, to apply and plow in a heavy coat of stable manure. I tell you to prosecute the man who hauls a load of stable manure into your peach orchard. Dread it as a burnt child dreads fire. It is death to all hopes of continued profitable crops. It contains too much nitrogen; it pushes too soft succulent growth for the development of healthy wood and buds; it renders it incapable of withstanding the inclemency of our rigorous winters, with their many changes. The growth continues too late in the season, winter sets in while the cells are gorged with immature sap, the freezing ruptures these cells, the vitality of the tree is impaired, rendering it a fit subject for the attack of fungus or other bacterial diseases.

Soil must have humus; a reasonable amount is necessary, but I would rather bank on a soil deficient in humus than on a soil with a surplus of nitrogen. I have never seen a soil so devoid of humus that I could not raise peaches by continual culture. Attrition will render the soil loose, porous and retentive of moisture, when, by the application of fertilizers in an organic form, I can raise maximum crops. How shall we get humus in the soil? This should be put in before planting; it can be better prepared while the land is clear than at any future time after the trees are planted. This can be done better by plowing under a good stiff sod a crop of cowpeas, crimson clover, or some other crop that will put the necessary humus in the soil. Should the land be too steep or rocky to plow, then large holes should be dug, plenty of inorganic fertilizer applied, and after the trees are planted they should be heavily mulched with straw, spoiled hay, weeds, grass, or any other waste material that will aid in retaining moisture and keep the soil loose.

AGE OF TREES TO PLANT.

One year is the limit; strong healthy trees, four to six feet high. Do not be tempted to take June buds, or two-year-old trees at any price. I would not take them as a gift. The best is none too good. It is the foundation of our future hopes, one of the essentials of success.

PRUNING.

Everyone has their ideal. Some prefer a low bushy tree; some want a vase form; others want a tree with a long trunk, that a horse can walk under the limbs in cultivation, raising their fruit on the second story, claiming it will ripen the fruit better. I prefer coming in on the ground floor.

Strangers visiting the Paragon Orchards are surprised at the extreme low heads on all the trees. Trees coming five years old have a top diameter of fifteen feet or more and the lower limbs starting not over one foot from the ground, and running out horizontally, with their tips touching the ground, instead of vertically, as we see them in other orchards. These lower limbs, after having produced three heavy crops during their short lives, are again this season (1907) laden with a good set of fruit. These trees are so low that all the fruit can be picked from a five-foot step ladder; nine-tenths of the entire crop can be picked while standing on the ground; fully one-third of the crop is borne on limbs that rest their tips on the ground. Many people argue that fruit borne on these bottom limbs will not mature, will lack color and flavor, but this is a mistaken idea. The fruit on these lower limbs acquire a finer color and higher flavor than most peaches in other orchards under different management. This orchard is a model of beauty; trees low, spreading, symetrical in form, with open heads; fruit being borne in the center as well as on the outside of the trees; there is no part of the tree that does not sometime during the day get sufficient sunshine to prevent the development of fungi, and at the same time develop and mature the fruit to the highest state of perfection.

Before giving my method I will give my reasons for pruning:

1. Removing the parts of the tree not wanted improves the parts remaining by the distribution of more nourishment to the remaining parts. In nature there is always a struggle, the weak must succumb to the strong; without pruning the limbs having the best positions thrive at the expense of the others. This can be avoided by proper pruning, and any desired form given.

Pruning should be done annually, so as to avoid removing large limbs, which is always more or less injurious. By judicious pruning a tree can be kept in bearing indefinitely, as new bearing wood is being formed annually throughout the tree. By reducing the struggle for existence among the limbs, the fruit is always larger, higher colored and of better quality. Heading in the stronger limbs tends to throw the weaker ones into fruiting. Heavy pruning tends to produce tops, as the roots remain the same. At the Paragon Fruit Farm all peach roots are pruned to about five inches, the trees are then set about one inch deeper than they stood in the nursery. The tops are pruned before or immediately after planting; all side limbs are removed, and the stem cut back to ten or twelve inches.

I prefer a medium sized tree, as there are no large limbs, but plenty of dormant buds on the stub to form a fine uniform top. The shoots coming from these buds give the foundation upon which to build. Very little pruning is required the first summer, but the following spring is the time to select the foundation branches, four or five coming from different directions on the stem should be left to form a symmetrical top, all others should be removed, and the foundation branches cut back one-half or two-thirds, according to the vigor. Never leave these limbs in such a position that they form a crotch, which is liable to split and ruin the tree. Very vigorous trees will require some pruning during the summer.

THIRD SEASON'S PRUNING.

If the trees have been properly handled they should be well set with stout, healthy buds, and should produce an average of one-half bushel of choice fruit this season. The pruning this year should not be so severe. Thin out the branches that crowd and cross each other, cut back those branches that are growing too tall, cut above an outside bud to give spread of top. Cut latteral branches just sufficient to cause new growth along the main limbs, thus keeping the entire inside of the tree in fruiting condition. Should any portion of the tree become too thick to admit free circulation of air and sunshine, then thin out anytime while fruit is maturing.

The future pruning is conducted on the same principles, keeping the top open and spreading, and all bottom and lateral limbs in good fruiting condition. Never remove bottom limbs unless compelled to do so. If pruned as they should be they will produce heavy crops for many years. I know this is contrary to the doctrine of the majority of peach raisers, but if wrong, then why have I constant increasing crops of fruit annually, even when there is a total failure all around me. If I am right, then why should I not continue along the same lines. By thy works shalt thou be judged.

I have a peach orchard that was planted in the spring of 1902, and trained by this method, that has few equals. In the summer of 1904 it produced one-half bushel basket of choice fruit per tree. In 1905, it produced three baskets per tree; last season, 1906, it produced four baskets per tree. The proceeds from these three crops have averaged over $1,400.00 per acre. This season, 1907, there is again a good set of fruit on the trees.

CULTURE.

Clean culture is an absolute necessity for a profitable peach orchard. Many think it impossible to keep up clean culture where trees are standing with limbs coming together and resting on the ground, but it is all in the knowing how. It is presumed the ground has been thoroughly prepared by plowing to the depth of ten or twelve inches and put in the best condition before the trees are planted. The distance apart should not be less than twenty feet. My planting this spring has been fifteen feet by twenty-five feet; better give more space than less. The first season after planting apply not less than 1,000 pounds of high grade fertilizer per acre, and plant to early potatoes between the tree rows, and cultivate at least twice a week as long as the potatoes permit. Remove the crop as soon as possible, work the ground well with a spring tooth harrow and drill in two bushels of cowpeas (Whip-poorwill). Do not remove the crop, but leave them remain on the ground over winter as a mulch. Turn under early in the spring, again apply 1,000 pounds fertilizer, analyzing, nitrogen, 4 per cent.; potash actual, 12 per cent.; phosphoric acid, 6 to 8 per cent.; and again plant early potatoes. Cultivate thoroughly. As soon as the crop is removed sow two bushels of cowpeas and leave crop lie on the ground over winter. The third summer the trees are now large enough to require all the ground for their own use, as we expect a crop of fruit this season, so we apply only phosphoric acid and potash and cultivate from two to four times a week from early spring until the beginning of July. This is done first with a spring tooth harrow, working it both ways, after which the cultivation is kept up with a spike harrow. Do not continue cultivation later than the middle of July or the trees will continue their growth too late in the fall and not be sufficiently ripened in wood and buds to withstand the severe cold of our winters. By this constant culture the ground will be kept loose, always covered with a dust mulch, and the moisture retained even in the driest seasons. Many people think they do not have the time to cultivate so often, if so, then do not go into peach culture. This clean culture is kept up year after year, and fertilizer applied as needed. The question here arises, How shall we cultivate with the limbs meeting and ends on the ground?

Early in the spring, before the ground settles or becomes hard, take the spring harrow, divide the two sections, and place a broad steel frame between; this spreads the harrow, the team can walk in the middle, and the harrow with the levers bent creeps under the limbs close to the trees. Go once around each row both ways, then remove the frame, join the two sections and break up the middles, after which the section spike harrow is used. With this culture is kept up all summer until in July. Never leave a crust form; the drier the weather the more you cultivate, and the more moisture you keep in the ground, your trees and fruit will never be checked by drought and your reward will be manifold.

THINNING.

The man who attempts to raise choice peaches without thinning certainly does not understand his business. There are two methods adopted by orchardists, one by pruning, the other by hand-picking.

The former method requires good judgment and considerable practice to thin properly, as no rule can be set as to the number of buds to be removed; nevertheless it is best to prune peach trees with a view of reducing the number of fruits, and thus increasing their size without diminishing the number of bushels.

The young twigs of last season's growth need to be cut back to keep the tree within bounds. If the buds are nearly all alive, fully one-half, and in some varieties three-fourths of all the buds can be removed. Should it be discovered later in the season that the tree still has too much fruit, it can be further reduced by hand-picking. In fact, I always prefer hand-thinning, as many of the small growths have two or more peaches close together, and as the fruit grows they come in contact, whereas each specimen to acquire the best size and color should stand separate. This can be done only by hand-picking. For best results no two specimens should be closer than five or six inches. We can make this as a standard, then come as near to it as possible.

Thinning should be done as early in the season as the size of the fruit allows. This should be when it has attained the size of a cherry, before the kernels begin to harden. It is the seed developing process that exhausts the tree of its vitality. But if early thinning has been neglected, later thinning, even when the fruit is two-thirds grown, will benefit both tree and fruit. A combination of the two methods is adopted at the Paragon Fruit Farm.

ENEMIES OF THE PEACH.

These are many, and the successful fruit raiser knows by sad experience that eternal vigilance is the price of success.

PEACH BORER.

This insect is so well known that a description will be unnecessary.

Remedies. Many different nostrums and washes are recommended, but none of them can be relied upon. Hot water poured around the tree will destroy them; it must be used very hot, after the earth is removed, so as to reach the larva; but this would be impracticable in large orchards.

The method adopted at the Paragon Orchards is to throw the earth in a mound about six inches high around the tree; leave this during the summer, when the moth lays her eggs; they are thus layed higher on the stem, just above the ground; the young larva thus eats at the bark on the trunk instead of being among the roots. At the approach of cool weather these mounds are removed, and the larva and their work is brought into plain view, being above the ordinary level, they are much easier to destroy than if they were deeper down. This is left open, and in a couple of weeks the trees are again looked over, and those that escaped at the first examination are now destroyed, after which another mound is thrown up to remain until the following season. The knife and the wire are the only sure remedies.

YELLOWS.

This is a fatal disease, and thus far no remedy has been discovered. The only means known to prevent its spread is to dig up the tree and burn it at the first symptoms. The first really noticeable one is the premature ripening of the fruit on one or more limbs.

Rosette and Little Peach should be treated the same way.

PEACH LEAF CURL.

This is a disease that seriously affects the leaves, flowers, tender shoots and fruit of the peach. Its action is most severe in the spring of the year, shortly after the leafing of the trees, and the greatest injury is caused in wet seasons and in humid locations. The direct annual loss to the peach interests from leaf curl is very large, usually much larger than is suspected, as the nature and action of the disease is misunderstood, and their effects frequently attributed to other causes.

In case curl appears after a severe cold spell in spring, as is quite common, the orchardist is apt to charge the loss of fruit to the low temperature rather than to the disease.

The direct cause of the disease has long been known as a parasitic fungus, but the development of the fungus is distinctly corelated with special physiological phenomena of the tree itself. These conditions of the tree are in turn dependent upon such external influences as temperature, humidity of soil and atmosphere. However, too much stress cannot be laid upon the fact that the fungus alone is responsible for the injury to the tree. Without the parasite not a leaf would curl, or a peach fall on account of this malady. In fact, no such malady would exist, and it is fortunate that the direct cause is a parasitic fungus rather than unfavorable atmospheric conditions, for the latter could not be controlled, while the control of the fungus is not only practicable but simple and inexpensive.

TREATMENT

Is more largely preventive that curative, by the destruction of the spores before they become established, by the use of one of the fungicides, such as sulphate of copper, Bordeaux mixture, lime and sulphur, etc. At the Paragon Orchards the lime and sulphur mixture (without salt) is used exclusively. It destroys the San José Scale, and is a specific for the leaf curl. One single application while the tree is dormant is sufficient for the purpose. Mildew, black spot, sooty mold, brown rot, etc., can all be held under control by proper, intelligent spraying.

MARKETING.

The many different phases of this subject thus far treated are all very important, and no one can be neglected without seriously affecting the quantity and quality of the fruit, as well as shortening the life of the tree. But what are the benefits to be derived by the production of large crops if they are not properly handled and placed on the market in the most acceptible form to bring the best prices as remuneration for their time, labor and money bestowed upon them. In fact, under such conditions the larger the crops the greater the loss, as it costs time and money to gather and handle these products. Therefore, it is plainly seen that the financial success of the fruit raiser depends entirely upon his ability to handle, care for, pack and dispose of the products of his labor. This seems to be the one weak point with the majority of farmers. They think if they produce the goods their task is done, and it is the other fellow's duty to come and pay good prices for their goods and carry them away, and because the looked-for-customer fails to materialize, they decry the business as unprofitable, and give their attention to other branches requiring less energy and brain power.

I have a friend who has a large orchard and raises abundance of fruit, but who unfortunately must have been born in the sign of the Crab. He is so slow he never gets ready to do a thing until it is too late. It is then put off until next season, when the same thing is repeated. His apples are never picked until after the finest ones have fallen; the balance are then picked in bags, poured on heaps on the ground. The best windfalls are also picked up and put with them, there to be left until cold weather compels their removal. Many are over ripe; all are more or less injured by heat, cold, rain, etc. They are then hauled home on springless wagons, placed in a warm cellar, or put with little or no sorting into any old package, such as cement, fish or oyster barrels, and either sent to market or to cold storage until the market wants them. They are then sent to the commission man, and he, poor fellow, has an awful mess of it. Old moldy, filthy barrels, with contents unsorted, all smeary and moldy, some rotten, others scabby and worm eaten, unfit for anything but the dump pile; and yet he expects to get the highest market quotations. He watches the market prices, sees that good apples are bringing $5.00 per barrel. When his returns come in and he finds his fruit sold for $1.50 to $2.00 per barrel, he accuses the commission man of dishonesty. This is no fairy story, but the actual conditions under which three-fourth of the farmers' apples are marketed.

Is it different with the peaches? Not a bit; they receive the same careless handling and marketing. People do not think, they use no judgment. Last year a farmer came to my orchard for two baskets of peaches; he brought a bag to put them in. He was going to haul them four miles on top of a load of coal on a wagon without springs. I refused to put them in the bags, but gave him the baskets, but told him they would be unfit for use, as a bruised peach is worthless for canning, but he took them. The next day he came back for others, saying his wife refused to put them up. This time he came in a light spring wagon.

The first essential to successful marketing is to have the fruit carefully picked, handling it with the utmost care, nicely graded, running uniform in size throughout the package, as a few imperfect or small specimens greatly reduce the price. Then the package is a very important factor. It should be new, bright and clean, of suitable size and attractive. Many think this makes no difference, it being the fruit and not the package that makes the price. This is a mistake; that which is most attractive sells quickest. Look at the poor miserable Ben Davis apple; it sells at higher prices than many better varieties, but less taking to the eye, merely because of its beautiful exterior.

Then the size of package should be considered. Maryland and Delaware use the five-eighth basket. Pennsylvania peach growers are using the Standard sixteen-quart basket. This should be made of clean white wood, material one-eighth inch thick, well hooped, with a solid bottom. This carries the fruit firm without bruising, but costs a little more than those made of light veneer, but the fruit is carried in such fine condition that it readily brings from twenty-five to fifty cents more per basket. If the grower wishes to cater to the tastes and fancies of the best customers, it pays to have carriers and small handle baskets that can be carried along, holding from one-quarter to one peck, this being all one customer wants, and he is willing to pay for the privilege of getting just what is wanted. If the grower has not too large a crop, he can realize more money by canvassing the smaller towns. If he has several hundred baskets a day, he had better have one good man who has a fancy trade, and ship him daily what he wants, setting the price at your end sending an invoice with each lot. Never overload him. If you have peaches to spoil, let it be at your end, not in a glutted market. Have a man in as many towns as necessary, never have two men in the same town, thus putting your own goods in competition between your own salesmen, to your detriment and theirs. Never ship them anything you cannot guarantee, putting your name on each package, and having them sold as your goods. If you have sufficient to ship in carload lots, let the same rule hold, consign to but one man in the same town. Use the same care in grading and packing; make your goods so attractive that the public cannot help buying. Then have them packed with such honesty that a customer once secured is always retained.

In conclusion, I wish to say, that for the man possessed with intelligence, good judgment, industrious habits, and a love for the calling, there is no business of the present age that offers such strong inducements, such sure and profitable returns as peach raising.

THE SUCCESSFUL FARMER'S EDUCATION.

By Prof. Wm. G. Owens. *Lewisburg, Pa.*

Before trying to discuss the subject, it will be necessary to determine what we mean by a successful farmer. Is he a success who knows not what goes on in the great world around him, who living in the Twentieth Century uses implements of the Nineteenth and the methods of the Middle Ages? Is that man a success who, working early and late, without taking time to enjoy life as he goes along, becomes so overpowered with greed for gain that never a kind word is spoken or a gracious act performed unless he can see a dollar in it? Or could you call that man a success who, by fair means and foul, has added acre to acre, farm to farm, until he owns a vast tract of land? Is he who makes a simple living only or he who acquires health always a success? The questions are a sufficient answer.

Whom then can we call a successful farmer? He is the best farmer, as he is the best citizen and the best man, who can make the best use of every opportunity that presents itself, who uses his brain to save his back, who is interested in and is kind and helpful to his fellow-man; who makes a cheerful home where wife and children are contented and happy, enjoying to the full the many good things Providence has placed within his grasp. What things are required of a successful farmer? The demands today are varied and numerous, and to prepare for them requires an education of no mean type. The competition of the times and the scarcity of help require that the farmer should be able to use the latest and most improved machinery in all branches of farm work. Most trades today are specializing, each man is doing a small part of the work in any industry, but with the farmer it is just the reverse. There was a day when the mechanic in the shop was a man of varied accomplishments. He could run any machine in the shop or do any kind of work. Now he runs but one machine. The day was when a shoemaker made shoes, now he only repairs them. The shoe is made by many different hands, each doing but a small part of the work on each shoe. From Monday morning till Saturday night the man at the last does nothing but drive pegs until it becomes second nature to him and requires no mental effort on his part, but he moves like an automaton. The watchmaker once made watches, cutting out every wheel, fashioning every part, and the watch had some individuality, but now brass rods are fed into a machine and at the other end come out wheels cut and polished, ready to be assembled into a watch. Ten thousand of them, all alike, interchangeable of course, therefore easy to repair. But in a thousand no one could discover a difference except in the number stamped on each. All character and individuality has gone not only in the watch but in the watchmaker as well. The same thing has happened in nearly every trade. The individual has became a machine or the machine has taken his place.

On the farm how different? While there has been a change it has been in the opposite direction, to broaden the farmer's sphere of action and make him a more all-round man. Fifty years ago the farmer alone, or with the help of a blacksmith, could make most of the tools used on the farm. The plow, harrow and plank drag, the sickle, scythe ,wagon and home-made rake, and the fork and flail comprised the farmer's tools. Things so simple required but little skill to keep them in repair. Therefore it was supposed that anyone could be a farmer, and that he needed an education. Then a little scratching brought abundant crops from a virgin soil. But now how changed. What knowledge and skill are required of the farmer today when he must use and keep in repair disc and sulky plows, patent harrows, drills and rollers, binders and threshing-machines, hay elevators and silage cutters, engines which take the place of an ox and horse-power and a score of other things of which our grandfathers never dreamed. To successfully handle these machines requires a skill far surpassing that required by the so-called mechanic in the shop, who only runs one machine or does one operation day after day for months and years. The farmer of today must be versed in practical mechanics. When the binder breaks he must know how to fix it. Many farmers are near water power which could be converted into electrical, to be used in house and barn. Or the alcohol engine may soon be a factor on every farm, and the farmer must understand them all. As help becomes more scarce these sources of energy must be employed.

The farmer of the future must understand breeding. He will not raise scrub stock as his father does today. No other calling would or could stand such a drain as the profitless cow and hen impose upon the farmer today. When the farmers realize that today half the cows in the United States do not pay their keep, and that it is within his power to make each one yield a handsome profit, then he will begin to do something to improve his stock. The scrub cow belongs properly to the scrub farmer, and that man had better move to town. Of course a high breed cow or horse will not stand abuse like a scrub, but needs intelligent care. This can only be possible through a knowledge of animal physiology.

If he goes into the raising of fruit he finds as much need of brains as in any other branch of farm industry. The varieties suited to his soil, climate and market, the insect and fungus pests and how to keep them under control, the proper culture and marketing of fruit all call for an ample supply of brain power. In the feeding of both cattle and land the farmer in Pennsylvania is so well protected by the law that he need not be cheated in what he buys, nor wasteful in what he uses, but to calculate a balanced ration for field and feed room requires that the farmer should have some idea of chemistry. To produce, keep and successfully put upon the market the various mill products and to properly construct his home and other buildings, it is almost necessary for the farmer to be a sanitary engineer. If the consumers in our cities only know how much of the value and the enjoyable quality was lost and how much filth and other poisonous material was introduced through the improper handling of the dairy products they would think twice before they buy. The farmer must also be a business man. Not only must he be able to produce in the most economical manner something which will bring the highest price, but he must be able to put it on the market in the most acceptable manner. He must also be an experimenter. From the first paper presented at this Institute we have been constantly told that the men who are successful are those who experiment, observe, ply nature with questions and are able to get from nature the correct answer. That this is no easy task is seen by the fact that college professors and experiment station experts often hold opposite views on the same subject, and the institute lecturer is often at a loss to know what is the truth or the best practice. He must keep account of what it costs to produce, and he must have the nerve to cut off or change that which does not realize a profit.

Not only this, but as the making of money is not the final end of the farmer's existence, though an important one, there must be a broad and kindly spirit which will enable the farmer to enjoy life and help others to do the same. The rural delivery enables the farmers to have his daily paper at his noon-day meal and so keep in touch with all the world. He must be prepared to act on the school board, or go to the Legislature if his neighbors think best, and be a leader in the community. If these points which I have mentioned are essential to a farmer's success from a financial, social and political standpoint, what kind of an education will he require? I can imagine someone saying "That would mean a college education, with half a dozen years in the graduate schools." While I do not agree with the sentiment that a college education will ruin a good farmer and would go so far in the opposite direction as to say that every good farmer would be improved by a college education; nevertheless, I believe that public schools should furnish an opportunity to every farmer's boy and girl to get all the schooling necessary for a successful life upon the farm. What the country boy needs is thorough grounding in the rudimentary elements of knowledge in the several branches of science. Where did the leaders who do the actual work in the cities come from? In the vast majority of cases from the country.

That he can acquire and use this knowledge is abundantly proven when we look at the leaders in every branch of life today who have come from the farm. No calling is without them, no trade could get along without having its ranks constantly recruited from the country. The education which this condition demands is a thorough common school course, devoted mainly to those branches which the schools will use in later life. But you ask is such a course possible for a farmer's boy and girl in a rural community? I answer yes, it is. The farmer's boy and girl are entitled to just the same advantages that the children in the towns and cities enjoy; first, because the farmers are the great producers of the wealth. They take it first hand from the earth. As most all other branches of industry are dependent, directly or indirectly, on the farm, what would become of the town if the farmer should disappear? Why do we have great railroads, which have turned themselves into gigantic trusts, if not to haul the produce from the farm? Mills and factories are built to work up the farm products. The iron and steel industries exert to a large extent to house, transport and manufacture that which is yielded by the farm. Let one crop fail over an extended area and every trade and occupation feels the effects. A failure of a single staple crop would mean failure and wide-spread ruin. Should not then those who manage the most important factor in the country's prosperity receive the best education possible? Today every town and village has its high school, and in the cities many of them are better than the colleges were a few years ago, but the country on which the nation depends for its prosperity has the same old school that was the pride of the community a century ago. It has the shortest term and the poorest schools. The teachers are the cheapest, and often the most inefficient, the schoolhouse poorer still, while the equipment is the least the law allows. The millions in the city depend upon the farm, yet every man's child has the opportunity to get a good education except the farmer's. It has long been the disgrace of the country districts that the cattle and horses are better provided for and trained than the children. Farmers who have ventilators in their barns have been known as school directors to vote against putting modern heating and ventilating systems in the schoolhouse, because it cost too much. A few months in the year when the weather is the coldest and mud or snow the deepest is the only time the country children have a chance to prepare for life's work.

As a second reason, it may become necessary in the near future as a means of self-preservation. A few years ago Dr. Wm. Cook, in a lecture before a British Association, showed by statistics that as man advances in civilization he requires a wheat diet, that about all the land adapted to the growth of wheat is under cultivation, and that unless more grain can be raised per acre the wheat crop will soon be below the demand. He suggested the fixation of atmospheric nitrogen as the remedy. May it not be possible that a cheap source of nitrogen will not alone solve the problem? Would not more intelligent farmers who could understand and apply the laws of nature be a more likely solution than the mere cheapening of a fertilizer? If what I have said is true the successful farmer's education demands that the future farmer and his wife should be educated in the elementary principles of mechanics and electricity, to understand the machines which he has to handle, and enough chemistry must be added to enable him to understand and work out a balanced ration or a fertilizer; bacteriology and sanitary science so that he may combat the lower enemies which are on every hand; mathematics and bookkeeping sufficient so that he can keep account of the profit and loss account; enough of nature study that he may find pleasure as well as profit in observing what is going on around him and make and interpret such experiments as will improve his crop production. Enough independence should be installed that the young man may think for himself and be able to cut loose from the methods used by the forefathers and try up-to-date methods; enough history, literature and art to make the farmer's boy and girl appreciate the surroundings in which they live and the country life around them, so that they will appreciate their surroundings and not be in a hurry to go to the cities where they can make a few more dollars.

This it seems to me is what the successful farmer's education demands. This I realize would necessitate a great change in our common school system, but you see with few exceptions it is only trying to teach the children what the Farmers' Institutes are trying to teach the farmer and his wife. We all realize that "It is hard to teach old dogs new tricks." The time to innoculate new ideas is during the years of school life, then all could be reached. What a small percentage of the farmers now get any benefit from the instruction which the State so liberally supplies in the institutes. Centralizing rural schools would be necessary. The cost of education, in the long run it would be an investment that would pay well and of which we could well be proud.

THE SOCIAL SIDE OF FARM LIFE.

BY MRS. SARAH B. FRITZ, *Duncannon, Pa.*

The social side of farm life is a very important one. If we want to get our full share of anything but existence out of our lives, we must not live so close within the confines of the farm that we become narrow and selfish. We are all placed here to help one another, and you will always find most happiness in a community that has a free social life.

The very best way to foster and maintain a free social life in a farming community is by the organization of an active Grange, having for its object the advancement of scientific and profitable agriculture, and the establishment of a freer and better social life among the members. Some one recently spoke of Penn township as being one of the most intelligent and progressive farming communities in the State, and remarked, "I suppose it is all due to the longer school term" (it is eight months). "No," replied the other, "it is all owing to the Grange." And that is true; wherever you see a good Grange, you will find broader intelligence and greater unselfishness, and a freer social life, and an interest in the work of the Farmers' Institute. Where there is no Grange, good literature will do much to promote the social life, and make the family life brighter and happier. A good library is a source of pleasure and profit. Devote at least a small part of each day to reading the standard authors, and keep abreast of the topics of the day; thus you will keep heart and mind active, and be in touch with things outside of the daily routine of farm work. Discuss them with your family and your friends. A frequent exchange of visits should be encouraged in any community; have, if possible, a set day each week for receiving your friends and going visiting. So arrange your work that you will have time for social pleasure. Always be cordial in manner if unexpected company comes in near mealtime, or the husband brings home a friend without warning to dinner. Do not change your meal, but give them the best you have in such a gracious manner that they will feel they are welcome, and will want to come again. Take time for the social visit to your neighbors, and in helping others you will find that you have been helped yourself. If you come home with new ideas, the monotony has been broken, and you can take up your work again with renewed courage.

To many the life of the farm means isolation. This is a mistaken idea. True, we work hard, but what vocation does not work hard? Think of the many delightful surroundings we have, compared with many others. Nature is a great teacher, and we have her ever before our eyes, and instead of the noise and hum of machinery, we have the music of the babbling brook and the singing of birds; we have the beauty of the budding flower, the green grass and the blue sky—the starry skies instead of the electric light of the city. The life of the country is the life of the spirit, and it gives us not only a love of the beautiful now, but we feel that when we leave this world, the soul will rise to a higher land of beauty. Without the uplift of a love of nature, and the study of her teachings, we make our lives a tread-mill; we make our work drudgery, and we become slaves.

The love of reading is another thing which helps to pass many otherwise heavy days on the farm. Let us aim to have a small library of well-selected books in our homes, and if we can get only one or two books a year, let us do so, and economize in some other way. To bring one's heart and mind into contact with the best books is the best you can do for yourself. You may think you have no time for reading or study, but so systematize your work that you can have at least half an hour a day; or if your days are all filled up, keep some of your evenings for reading and writing. This is more especially intended for the ladies. The men usually have their evenings for reading. If we once realize that it is just as necessary to keep our minds bright as to keep our houses in order, we will manage to find the time. It is surprising how many fragments we can find to use in this way, and just a little at a time means much in the end. Books are the best friends of our lonely hours. No power on earth has a greater influence in the formation of character than the right kind of books.

Our first duty is to take time to keep our minds bright and active, and to enjoy our pleasures with our families, for there will be laid the foundations of future happy homes. We have, first of all, to make our own home a home in the true sense of the word. We should remember that money, or its equivalent, is not the main thing in life; that true honor lies in living life with a useful purpose. We want bright, happy, intelligent homes, filled with love and truth, where the husband comes in with a smile, and the wife and mother greets all with gentle words and a kindly manner. Such a house is a home—not merely a habitation. Such a home is one of God's evangels in a dark world, and its influence extends out over other lives. We want to remember that

"We live in thoughts, not years;
In feelings, not in figures on a dial.
We should count time by heart-throbs; he most lives,
Who feels the deepest, thinks the noblest, acts the best."

Some people have more heart-throbs than others. We will always have our Martha's and Mary's, but let us live up to the best in us, and strive to uplift and help others, and our influence will go out in ever-widening circles. Let us write our names in living characters on the hearts of those with whom we come in contact. Have you ever stopped to think how many lives touch yours in a month, in a year or in a lifetime, and in how many ways? And yet, on each one we leave some influence at work. How necessary, then, a great and constantly growing sympathy to enable us to be ready with a word of cheer and encouragement whenever opportunity offers! Don't wait until you have the time; seize every opportunity, because while we are waiting, time flies, and the word remains unspoken, without the word that would have meant so much to the discouraged soul.

And while we are ever ready with the word of cheer and encouragement, let us withhold the word of censure we are so often tempted to speak. We do not know what has been the influence which has led them to put to a wrong use the talent that God has given them; let us remember that "with what measure we mete, it shall be measured out to you again," and feel with Stevenson that

"There's so much bad in the best of us,
And so much good in the worst of us,
That it hardly behooves any one of us
To speak about the rest of us."

If we were one-half as anxious to discuss our friends' and neighbors' good qualities as we are to talk about their bad ones, the world would be a better place for us all.

Now, it is not given to us all to do great things in our lives, so let us gather up the fragments of our little courtesies and little duties that fill our lives, and when at last we see God's design, we will find these things the beautiful mosaics in His temple. Each one of us has our part, and every day that helps some one is a great deed. Mothers, to you especially is entrusted the great duty of caring for the little ones given into your charge. If at times you would like to do a great work, think of the importance of training these children to take their places in the world. It has been said that if the world is ever saved, it will be by home training, and nothing else. If at times your tasks seem hum-drum, think of the story of "The Other Wise Man," who started out with the three Wise Men to find the King, but was detained again and again by the opportunity—the necessity of helping a fellow mortal—until the Christ had always left the places in which he searched for him, before he reached there, and he went on, serving and searching, for thirty long years, and only found Him when Death came to call him while he was helping another, and then he found that in serving humanity he had served the King; in doing these little hum-drum tasks of the daily life he had won the commendation of the Master, who told him "Inasmuch as you have done it unto one of the least of these my children, you have done it unto Me." Let us then seize every opportunity of service, however small, knowing that in serving humanity, we are serving the Master.

RURAL EDUCATION.

BY DR. A. C. TRUE, *Director Experiment Station, U. S. Dept. of Agri., Washington, D. C.*

Ladies and Gentlemen: It gives me a great deal of pleasure to come to Pennsylvania and, in some slight measure, get in touch with your Farmers' Institute work. You have given me an important subject to discuss, but I shall hardly undertake at this late hour to more than touch upon certain phases of it.

Fortunately, we have had brought before us tonight already the three great elements that enter into education—the church, that appeals to the spiritual life of man; the school, that teaches him how to think and act as a rational being, and the family, wherein he works out day by day the plan of life. All these things must enter into life, and unto the education of the man on the farm, as well as the man in town.

Before taking up the question of normal schools, we will look at the training of the different branches of these educational institutions. Rural education is a particular subject, and we must have different kinds of institutions to make a full system of rural education. Within the past week I have attended the semi-centennial of the first agricultural college of this country, and we have had brought before us very vividly the cause of forwarding the work of our agricultural colleges, which stand at the head of our system of rural education. We are training laborers for the upbuilding of the nation along agricultural lines. We will have a great place in the world along these lines, and this is only one plea among many in the claim for rural education.

Today I spent a few hours at the National Farm School, near Doylestown, in this State, where we have an institution which is training city boys to be farmers. Now, that is an important evolution, and it seems to me they are doing it very well there to a limited number of boys from the town. There is, as you know, a considerable movement of the people from the city to the country, and we will all undoubtedly agree that there is a place for this farm school for city boys, but in between the Agricultural College and this Farm School for city people, there is a great loss to our country people, and we must have other institutions to give them the education they need to fit them for country life, and so I wish to speak tonight briefly concerning this phase of rural education, which we should have in connection with the common schools and the secondary schools.

It will not be necessary now to state why we should have a change in the common schools of the country, but I will say simply that the chief preliminary is to so grade our common schools that they will adapt themselves to the education, the elementary educational study of the modern phases of country life. The conditions under which you are farming, as the older member of this assembly at least, will strongly recognize, are quite different from the conditions which existed in the country in past years. Now, to make these country schools what they should be, it is not, in my judgment, necessary that we reorganize our school system. We should rather build on what we already have, and make such changes from time to time as will strengthen our schools and make them better adapted to modern conditions. Some of the changes, however, which I think will necessarily come in the character of these schools are very important in their character. For example, the course of study in our country schools has been one that has tended to draw people away from the country into the city. That has come about naturally enough, because the teachers in these schools have mostly been educated along these lines which are best adapted to city conditions, and we must change that; we must bring into these schools teachers in touch with country life; and country conditions, and we must so grade our schools that they will tend to the promotion of country life, rather than be the instrument for taking people as rapidly as possible away from the country.

There must be, and will come a general improvement in the country elementary schools. There must be some regrouping to make them more efficient. We have heard a great deal about the consolidation of schools. Now, there is no magic in that, and I do not think it is a panacea for the ills of our country schools, but it seems to me that in thinking about that, we must face the situation as it is. If we could have the ungraded school with forty or fifty scholars as they used to have it in old days, and with a well-educated man as the teacher of that school, who had the power to inspire his pupils and direct them in useful lines, then we should not need to propose that we re-group our schools, but, actually, we have schools that are so small that it is not possible in that condition to grade them properly, and because they are so small, because the districts are so small from which the children come, it naturally follows that it would be too expensive to bring the best type of teachers into such cases, and whatever sentiment we may have about the old-time country school, that should not, I think, stand in the way of our re-grouping these schools, consolidating them if you will, in order to make them the best kind of schools, and then we can give more attention toward making the situation as it already exists in the schools contributory to agriculture and country life. There is no doubt but that the ordinary studies of reading, arithmetic and geography may be so arranged as to be primarily connected with the work and life on the farm, and when that is done, we should change the curriculum so as to make much better schools than we have today, and I think that is possible in these days, and bring into our country schools when they are properly re-organized and provided with good teachers, a certain element of nature study, and of agriculture, which will be very helpful in instilling the proper spirit in these schools and in turning the attention of the children to the newer ideas in agriculture to the new, progressive agriculture, and leading them to see that in agriculture itself are found many subjects of study which will be useful to them in their future life, and benefit them in many ways.

I think we should do something to promote the teaching of the elements of agriculture in the public schools, and through the association of Agricultural Colleges and Experiment Stations, working in harmony with the National Experiment Station, there has been produced a set of working materials which may be used in elementary schools. I have here a bulletin which we have just issued, entitled "Experiments in Elementary Agriculture." Now, I cannot go into this subject, but I shall be very glad to have you take the number, and if you are interested in the matter, write to the office of the Experiment Station for a copy. It is Bulletin 186, of the Office of Experiment Stations, the title being "Exercises in Elementary Agriculture." Now, in this bulletin we have tried to show what may be done with the simplest kind of apparatus, much of which can be made by any boy who can use an ordinary knife, and making the exercises of such character as will be suitable to the common schools. These exercises, I might say, we do not claim any particular originality for. They have been gathered from various sources, and most of them have been successfully used in schools. Now, we do not expect that exercises like that can be used in the poorest type of country schools. If you have a school building which it is impossible to heat in winter, of course you can't grow plants in the winter. Some of the exercises can be used in city schools. To make good use of these exercises in a complete way, you must have a schoolhouse that is fairly warm through the week and other things of that sort. Then, of course, this is not material which can be used with very young children. It is really intended to be used in a common school which is graded to a certain extent at least, in the seventh or eighth grade. That is, for children anywhere from twelve to fifteen years of age. I don't think I will take the time any more to go into the matter to call attention to its imperfections. Of course, this work has been taken up in a great many places already.

Then, a number of good elementary text-books have been prepared, and I am informed on good authority that one of these text-books has already reached an edition of 200,000 copies, and I know it is being used very extensively, and with very considerable success in a number of states. Of course, in elementary schools we can do but little in teaching that which relates directly to agriculture, so we must supplement the elementary school as far as possible with the high school. Now, the high school is practically a new institution in this country, although it is favored with a considerable number of pupils. If you had gone back I think about fifteen years you would have found the number of pupils attending high school in this country, but then the high schools were chiefly in the larger cities, and did not exceed 200,000 of the entire population. In the course of the next ten years the number had risen to over 600,000, and today we have probably 800,000 students in our high schools. That shows how rapidly people have taken to the idea that the public should support elementary education.

Now, if secondary education is a good thing for the city people, I think a fair presumption would be that it is a good thing for the country people also. Now, the city high schools have been more and more modified to suit the conditions of city life, until today, in many of our cities, we have not only the ordinary elementary studies in the high school, but we have a high school business course, and a domestic course, and a scientific course, and a manual training course, and these are growing more and more popular. Now, in the same way we must have this specialized education for our country people. We must introduce into these schools special studies on the conditions of country life, and in these schools we can teach a considerable amount of agriculture, and subjects relating thereto, and there is no doubt about it, it can be done successfully. It has been done in other countries, and the system of secondary agricultural education now existing in a number of European countries is thoroughly successful. All the students of education that have looked into this matter, are, I think, agreed on this point. We are beginning to organize such schools in this country. There have been organized, I think, eight. We have them connected with our agricultural colleges, and we have also in a number of places, rural high schools.

I cannot enter into a discusion of the best plan. Indeed, I am not sure that there is a best plan. The probability is that we shall come to have high schools with different agricultural courses, graded according to the different conditions in those regions and states. The main point is to get a fundamental elementary education along agricultural lines. We have recently been interested in the Department of Agriculture, in an effort made last year to establish a secondary agricultural school in a rural community in Maryland, and it may be of some interest to you, if you have not followed that movement, to learn something about that school, which is a little different in some respects from other schools of the same class. There was a rural community in Maryland which found itself without high school advantages, and the people began to be waked up, and of their own motion to want the high school. They took up the question with the school commissioners, and the more they talked about it, the more they thought they wanted to have agriculture taught in their schools. So they called upon the Department of Agriculture at Washington, and also upon the Maryland Agricultural College, and we found there the first man, a man who had already had experience in teaching agriculture in secondary schools, and so there was established at Calvert, Cecil county, Maryland, a school known as the Calvert Agricultural High School, and Mr. H. O. Sampson was made the teacher.

Now, this finally became a town enterprise, and local people put money into it, the county commissioners making an appropriation, to get the school established. They were also fortunate in finding a building ready for their enterprise, which had been used as a denominational school, and which they were able to obtain at a nominal rent. The school opened on the first Monday in November, with thirty-two pupils enrolled, in age from twelve to eighteen years. They were arranged in two classes, the one with what would be the first year in a literary high school, and the other with what would be the seventh grade as a preparatory class. It was thought that one teacher would be enough, but the attendance increased so fast that they were soon obliged to secure an assistant teacher, the attendance finally reaching fifty-two.

This is simply an example to show you what can be done where the people are interested in agricultural education. That school has the ordinary high school course—a considerable amount of English and mathematics, some literature, and science and history. In the last two years they have either a modern language, German perhaps, or Latin of they prefer it, and after the pupils have completed the course they are entitled to admission to the Maryland Agricultural College. Now, the agricultural part of the work includes text-book studies, talks by the teacher supplementing this, and also demonstrations and experiments in practical agriculture, tree-growing and pruning, corn growing, stock judging, and so far as possible, the ordinary studies are so planned as to co-relate with the agricultural studies, so that with arithmetic and physical geography, they also have agricultural work. Then, during the first year special prizes were offered to create more interest in agriculture. Then an agricultural program was given, in which outside speakers tried to interest the people in Farmers' Institutes. This was held in a little town about four miles from the school, and the school went out there in big farm wagons, and the boys showed how they could judge corn and stock. Now, one of the most interesting things about this school is the number of pupils who took no interest in the ordinary school course, but when they found something doing in regard to agriculture, they came to school, and became greatly interested. and more than this, the establishment of this school has led to the organization of a large number of elementary classes in agriculture in the surrounding schools. I wish I had the opportunity, and could go into this matter further with you, and tell you more about this school, but that will be impossible at this time. We will, of course, be glad to give you any information about this matter if you will write us about it.

These are, in a general way, the lines in which I think we ought to work; that is, first in elementary schools, then by the establishment of these secondary schools, in which agriculture shall be taught, and which shall be chiefly a preparation for actual farm life, and, of course, if you once get these secondary schools, they will be a good preparation for our agricultural colleges.

Now, as to the situation here in Pennsylvania. I have given it a little attention, and I think you are ready for the advance movement along the line of rural education. You have, I understand, made a very large appropriation for schools, and for good roads. Now, these two things go together. You have your high schools, which you can proceed to reorganize for agriculture, and you are re-organizing your agricultural college with the idea of making it more efficient as a college, and of allying it more closely with the educational system of the school, so it will be able to help in this movement for the improvement of rural education. You are bringing into this State, to the head of the agriculture at your State College, one of the best teachers of agriculture in this country, and I am sure if you are loyal to him, he will do a great work here in re-organizing along these lines. The United States has been doing its part to help you by increasing the national appropriations to the agricultural colleges and schools, and to what better use can these appropriations be put than to training the teachers for these elementary and secondary schools, and I understand that the colleges in this State, like the colleges in other states, is considering a plan now for carrying out that part of the work. Among other things I understand you are thinking of summer schools for teachers. Now, it is possible for the intelligent teacher in a summer school course to go through all the exercises that are contained in this bulletin, and that is enough for a year's work in elementary agriculture, so it is possible to help your teachers very greatly if they will attend these summer sessions at the Agricultural College and get in line with this movement in education.

At this late hour I will not undertake to go further into this matter. I thank you for your patient attention, and shall be glad, through the Office of the Experiment Stations, to give you any information which you judge may be useful to you in this great work.

The CHAIRMAN: The hour has become late, but if there is anything to say in discussion of this subject, we will give ear to it.

DR. DETRICH: A great many persons apply to me for information regarding agriculture, and I find that the whole situation is related to the education which boys receive in our public schools. It is a mystery to me that there are so many poor scholars come out of our public schools. I have time and again tried to get graduates of our public schools, or students, to parse a sentence of twelve ordinary words, but they were unable to do so according to the common rules of English grammar. What is the reason? Why are they unable to parse a simple English sentence? Simply because the children are not taught in the fundamentals. I have four boys on the farm today. They make no effort to advance anything. Their spare time is passed in novel reading or playing crap. They have no time to improve, or to experiment, or to study agriculture. Yet these boys expect to be farmers. But what kind of farmers will they make? I tell you, that the trouble is with the public schools of today. The teaching is superficial, and little attention is paid to the fundamental part of a boy's education. Now, these boys who expect to be farmers should be taught well in the fundamentals and have the first principles of agriculture instilled into their hearts and minds, instead of passing their time reading novels and emulating Wild West shows, they want to study Hoard's Dairyman, the New York Agriculturist, The Farm Bulletins, and other good and profitable publications of the same class. Instead, they get a little Latin, a little literature, and mighty little, too, and less of something else, and instead of becoming "Sons of Thunder" they become "Sons of Mush."

You talk about changing the schools we have in the country to arouse an interest in agriculture. It is the city boy who needs agriculture just as much as the country boy. You can't take any man, put the books before him, talk to him about farming, and make a farmer out of him. His heart and mind must be in the work first, and he must be grounded in the rudiments of the work. Whether in agriculture, music, or anything else, it is the same. The skillful pianist must first know the rudiments of music; the successful farmer the rudiments of farming. But the schools of today are teaching them stuff that will do them just as much good as that famous old classic "Old Mother Hubbard," or "Grimm's Fairy Tales," and then you wonder why so many of the boys go astray! I wonder they are as good as they are.

ON WHAT DOES THE QUALITY OF BUTTER DEPEND?

By Prof. H. E. Van Norman, *State College, Pa.*

Mr. Chairman: As I sat here yesterday and heard our chemists tell of the development in the study of soils, of the need of lime and the best methods of fertilizing the soil, heard our horticulturists speak of the problems that are still unsolved in that department, and then think of one of our Experiment Stations closing its dairy department, and abandoning the machinery because the important problems in dairying have been solved. It seems like presumption for me to come here and try to talk to these educators on butter-making, and that to speak on the subject as outlined would bore you. There are some things that I would call to your attention.

The more I study the situation the more I am impressed with the excellent home markets there are for first-class dairy products in Pennsylvania. One of the things that I think should be changed is the self-satisfaction of our butter-makers with the product they are putting out. Because there is such a demand for our butter, a great deal of it is sold direct to the consumer, and he becomes used to that particular brand, faults and all, but when the butter-maker takes that same butter to the Butter Shows, such as Chicago and St. Louis, our Pennsylvania butter does not get a very favorable score. This is a condition that should be changed, and I believe it can be changed to the advantage of all. We have started at our college an educational butter-scoring contest, in which we have invited butter-makers all over the State to join. This work is in charge of a man who has had ten or fifteen years experience in successful butter-making; he is not an experimentor or beginner, but has made butter and managed creameries in other states, and has been a judge at the National Shows. His judgment is so accurate that he is universally accepted as a butter judge by our associations of creamery men. He has recently accepted a salary of more than $4,000 a year to buy butter, because he knows what butter is.

Now, just as an example of the attitude of some Pennsylvania butter-makers, take a case that occurred recently. A sample of butter sent in did not score up well. The maker is provoked, and writes, "I never made any butter below ninety, and I have been a butter-maker for fifteen years. I don't believe your judge knows good butter." That is, of course, an extreme case, but as I get better acquainted with our State, I find that there are others who take the same position to a greater or less extent. If a man is perfectly satisfied with his butter as it is, there may not be any need to change it; we leave that to you. But when that butter, either farmers' or creamery, comes out to the Convention, it does not fare so well. The low scores are rather embarrassing to those of us who are anxious to have our State make a good showing when compared with Wisconsin, Minnesota, etc.

Here are some of the faults of our butter: First, an unnecessary amount of—in good, plain English—manure, due to lack of cleanliness in stables and milking. If you will clean up the cows the butter will be just as acceptable to the trade, and will fare better at the Conventions and National Dairy Shows. Pennsylvania butter-makers can produce just as good butter as any other state. Some are doing it; others can. The trouble is that we lack the uniformity which comes from comparing our own make with others. When I sit down in my little room and make butter, and see no butter except what I make myself, I have no means of judging wherein I fail or excel. My judgment is one-sided. That is the trouble with most of our butter-makers.

What I want in a judge is a man who is brought into contact with different kinds of butter regularly. He needs the variety and practice to keep his judgment accurate.

One fault I find with much of the creamery butter, as well as the farmer's butter, is that the cream is allowed to get too old. Our farmers hold their cream at home for one or two days before they deliver it to the creamery, and then the butter made from it has an old flavor, as the butter-maker calls it, and it is a flavor we do not want. The cream can be kept two days and kept in good condition if kept quite cold, but it is not wise to do this, as a rule. The same thing holds true on the farm, where only a limited amount of butter is made, and it takes two, three, four or even five days to collect enough cream for a churning. The facilities for holding that cream and keeping it in good condition, are not as favorable as we should have them. Therefore the cream is not kept cold, and is subjected to the odors of the cellar and of the cooking, of the washing, and of that boiled cabbage dinner that we sometimes have, and the result is unfortunate in the butter. I do not believe, though, that it is necessary to speak more of these things to you people who attend Institutes.

Then, there is the relation of the bacteria to the quality of the butter. I sometimes think we hear too much on this subject of bacteria, or, perhaps, not so much hear too much as hear it with lack of sufficient understanding. Bacteria have a great deal to do with the quality of the butter. They are minute forms of plant life; they are subject to the laws of plant growth, such as food, moisture and temperature, some other plants on the farm. Whether you have wheat or corn or oats depends upon how you treat the soil and what seed is allowed to grow. These bacteria are everywhere, and whether they are good or bad depends upon whether we control them or not. It depends on ourself whether wheat or weeds predominate in our fields.

Some of these bacteria produce the acid of sour cream; some produce alcohol in the wine, acid in the cider to make vinegar, and some produce the butter flavor. These things we thoroughly understand, but I find we do not appreciate the importance of preventing the action of undesirable forms. One of the most undesirable forms is the one I referred to a few minutes ago, associated with the manure.

The understanding of this bacteria problem has given us in our dairy work the use of "starters," so called. To the small dairyman who is making butter from five, six or eight cows, this is probably of little interest, but to the farmer who is aiming to do business with a dozen or perhaps thirty or forty cows, and making a business of supplying a high grade butter to a critical trade, it means something. To these people it is a question of supplying the kind of flavor they want in the butter. These "starters" are prepared in a laboratory, and there are firms that make a business of supplying them. Some of them include two or three different species of bacteria, others only one. In judging, we often find a piece of butter that has a very pleasant aroma to the nose, or, as the butter judge says, a nice nose flavor. But when you come to taste it on the palate, it has very little flavor. And then the reverse is true; when you try for the aroma it has none, but it has a very pleasant taste. Some of our makers of cultures have tried to combine the two species with very good results.

I believe that to the farmer making a considerable amount of butter, the "starters" may be useful if he is having difficulty in securing uniform results, though ordinarily he will not find them justifying the extra labor required to properly propagate them. We cant lay down any rule, because the man who lays down an iron-clad rule generally runs against a snag, but I would say that a judicious use of "starters" when necessary is a good thing.

The first principle in our butter-making is to have a clean, raw product and control the changes during the ripening of the cream so as to get the desired results. The market has changed in the last few years, and today it wants a milder-flavored butter than formerly. When we say "milder," we mean one in which fermentation during ripening of the cream has not gone so far. First, the cream becomes slightly sour, then it becomes ripe, then over-ripe. The difference is in the degree of fermentation, and the market today wants a mild-flavored butter, one that is not rancid or from over-ripe cream.

There is another change, the building of storage houses to store our summer make of butter. The inability of the butter-makers to produce enough for the market at certain seasons, has given us the storage butter. Such part of the great middle classes as are willing to pay only a moderate price for butter are using it, but a growing class of people are looking for a fresh butter with a flavor that can only be gotten within a short time after it is made, and I want to impress upon you particularly the necessity of uniformity of quality, especially during the winter, so that the people who want this extra good butter can have it. There are many people who are willing to pay from thirty-five to forty-five cents the year round for their butter. Make it right, and then find the people who are willing to pay that price. It can be done without much trouble. And keep it uniform in quality from day to day. Better have it score eighty-nine steadily than jump from eighty-nine to ninety-one or ninety-two or ninety-three, and then back again to eighty-nine.

There is a great market in this State for more of this high grade butter, and the butter Pennsylvania makes does not supply more than one-third of what we consume. We have always markets right close at home, and a large part of our butter goes direct to the consumer without the intervention of any middleman.

The increasing demand by the people of Philadelphia for a high class market milk has induced the Pennsylvania Railroad to extend its milk shipping district from something like sixty miles to one hundred and fifty miles. Pennsylvania had an increase in population of about 230,000 last year, much of it being due to foreign immigration. They must all be fed, if they only use a half a cupful of milk a day; or they may use a pint. At any rate they must be fed. And this increased consumption of milk diminishes the sources of butter supply, and gives us the proportionate increase in price for a high grade article produced nearby.

Some of the people who are making butter that commands regularly five cents a pound over the market price come home from St. Louis and the National Shows with a poor score. Still, they get five cents above the market price. Why? Because their trade has become educated to that kind of butter. I have known people who get regularly two cents above the market price to tell me that when they send their butter into the open market they fall four cents below it. Why? Partly because the market was supplied and did not need it, and partly because it was not the kind the market calls for. New York, Philadelphia, Chicago, Baltimore, all want the best. When you go into the open market and demand at least market price for your article, it must compare favorably with the accepted standard. I believe it is possible to make a butter that will score high in our Dairy Shows and on the open market, yet command the attention of that class of trade which will pay a premium above market prices for that which pleases.

The commonest faults are stable taints, old milk and cream, over-ripe cream that is held too long before churning.

SHEEP HUSBANDRY AND MUTTON PRODUCTION.

By Prof. Thos. I. Mairs, *State College, Pa.*

No animal has been so intimately associated with our religious, social and political institutions as has the sheep. From Abel to Abraham, from Abraham to David, from David to Jesus, the history of the Jews is the record of a shepherd race. From Syria to Greece, from Greece to Italy, from Italy to Spain, and from Spain to America, the ancestors of the ubiquitous Merino may be traced. From Iceland to Australia, from Turkestan to Texas, wherever civilized man settles, sheep are sure to find their way. Wool has played a prominent part in the game of politics in both Europe and America.

Although the subject of this talk, Sheep Husbandry and Mutton Production, seems to be a very broad one, no attempt will be made to discuss wool-growing or the production of winter or hothouse lambs. The latter is something of a specialty, and the demand for the product is too limited to make it of general interest. Further, it is said that cold storage lambs are to a great extent being substituted for the fresh dressed ones in season. Wool-growing, too, is a specialty and involves certain technical knowledge which does not properly belong to mutton production. The keeping of sheep for wool alone is not practical in the eastern part of the United States at the present time.

A discussion of the relative merits of the different breeds will not be entered into, as there is too much opportunity for a difference of opinion along this line. A general classification, as fine wool breeds, coarse wool breeds, and medium wool breeds, will be sufficient.

Sheep breeders from the earliest times have given attention to the improvement of the fleece, but it was not until the time of kewell that any attempt was made to improve the carcass. Probably the production of no class of live stock has varied more widely in the last fifty years than has the production of sheep. Until after the middle of the Nineteenth century practically all the sheep produced in the United States were produced for wool. Mutton was not regularly found in the meat markets. With the decline in the price of wool came an attempt to utilize the sheep to better advantage, which resulted in the consumption of larger quantities of mutton and in the change of the type of sheep from the wool to the mutton type. At one time it was stated that ninety-five per cent. of the sheep in the United States were Merinos or Merino grades. Now, east of the Missouri river the great majority of the sheep contain more blood of the Down breeds than of the Merinos. The Merino sheep have been compared in type to dairy cattle, the Down breeds to beef cattle. The Delaines and Ramboullets may be compared to the so-called dual purpose breeds of cattle. There is, however, hardly the sharp distinction to be drawn among the breeds of sheep that is possible among the breeds of cattle. West of the Missouri river sheep are still kept primarily for wool. In Pennsylvania at the present time probably sheep can be kept to the best advantage for the production of mutton or lamb primarily, and wool incidentally.

That Pennsylvania is adapted to sheep-growing is shown by past history, both in the eastern and western parts of the State. In the eastern part we have had some of the highest priced sheep of the United States. The first importations of many of the breeds were to Eastern Pennsylvania. Southwestern Pennsylvania, as is well known, was and is the home of the Delaines. It was largely in Southwestern Pennsylvania that the Delaine Merino was developed from the small American Merino. While the skill and judgment of the breeders were largely the means of this, the natural adaptability of the region to sheep-growing undoubtedly contributed quite considerable to the change of type.

The benefits of sheep to the soil have long been recognized. It is expressed in the saying that "the sheep's hoof is silver." A very large amount of the $5,000,000 paid for fertilizers in this State might be saved by further attention to the keeping of animals. There are no animals which would effect such a saving in the fertilizer bills as would sheep. No other animals can be used to so good advantage in building up worn out soils. No other animals are so successful in renovating run down pastures. The droppings are well distributed, and the greater part are left on the high places where most needed.

Sheep can be kept on rough pasture. They will eat a class of herbage that no other animal except a goat will eat; in many cases even prefer weeds to grass. Recent analyses made of some common weeds indicates that many of them are quite rich in protein, considerably more so than most of our grass crops. This is one reason why weeds are valuable as sheep pastures. It has been thought by some that sheep are hard on pastures, that they kill out the vegetation, but this is only where they are compelled to eat down into the roots or starve.

The number of sheep in Pennsylvania has diminished decidedly in the last thirty years, there being only about two-thirds as many in 1907 as in 1877. Nevertheless, the total value of the sheep in Pennsylvania was greater in 1907 than in 1877. There was a decided decrease both in numbers and in value from 1877 to 1897. Since 1897, owing to the greater demand for mutton and the increased price of wool, the numbers have increased quite rapidly. In 1897 there were less than half as many sheep in this State as there were in 1877. The number of sheep in Pennsylvania has not fluctuated in the same manner as the total number in the entire United States. In the United States there were more sheep in 1897 than in 1877. The greatest number of sheep in the entire United States, however, was during the years 1883 and 1884. In the year 1907 there were almost as many, but not quite. The growth of the mutton industry is fairly well shown by the receipts and shipments of sheep at the Chicago Stock Yards in forty years. In 1866 there were received at Chicago 207,987 sheep; in 1876 there were received 1,033,151; in 1886, 963,900; in 1896, 2,600,476; in 1906, 3,329,269. Thus it is seen that there was a continued increase. Although there were fluctuations from year to year, in general the increase has been fairly constant. The increased mutton consumption during the last seventeen years is quite strikingly shown by the total number of animals slaughtered at the four centres, Chicago, St. Louis, Kansas City and Omaha for each year. Beginning in 1889, the number of sheep slaughtered at these four centres was 1,476,000. There has been an almost uniform increase since that time to the year 1906, when the number slaughtered was 6,116,000.

The prosperous condition of the sheep business in the last few years is well expressed by the Drovers' Journal in its year book. Speaking of the year 1905, it says: "It is hardly necessary to say again that this has been the year of greatest prosperity for flock masters in every part of America. In Chicago record-breaking receipts have been handled at the highest prices ever paid for every class of market sheep offered. Sheep to the value of $23,700,000 have been sold in Chicago this year, bringing the owners $5,271,000 more than the value of their crop last year. Lambs selling as high as $8.25, with feeding lambs as high as $6.85; prime wethers up to $6.25; ewes, $6.10."

"Export trade in sheep this year has shown a falling off to 78,373 head, against 147,945 head last year, and 210,216 head for 1901, the record year in sheep export from Chicago. This falling off is explainable by prices so high in Chicago as to render exporting sheep the last half of this year very dangerous. Only 108 head have been exported the last two months of this year."

Speaking of the year 1906, the same authority says: "The past year has been the greatest one the sheep men of this country ever enjoyed, prosperity extending to every branch of the trade. A record-breaking run was readily handled on the highest average prices ever noted on the Chicago market. Prime native lambs sold as high as $8.50, and range lambs in season made $8.40, these prices standing the highest ever paid here, and prime wethers brought $6.50, being 25 cents higher than the best brought on the market the previous year. The movement of feeding sheep and lambs from Chicago broke all records, and the bulk of the stock was taken out at the highest prices in the memory of the oldest traders on this market."

Two years ago, J. E. Wing, in Bulletin No. 140 of the Pennsylvania Department of Agriculture, said: "Just now is an especially favorable time to embark seriously in the business of producing mutton, and incidentally wool upon the farm. The taste for mutton is growing with leaps and bounds in the United States." The reports from the Stock Yards just quoted show that this prophesy has been abundantly verified up to the present time, and there is no indication of a change in the near future. A taste for mutton has been acquired by the American people, and a better type of mutton is being produced. The sheep are being marketed earlier in life, while the quality of the meat is still good. If wool becomes so valuable that it is more profitable to keep wethers for the wool alone than to sell them as lambs or yearlings, it is possible that a decline in mutton eating will be the result. Such conditions, however, are not yet in sight. The Breeders' Gazette of May 22, states that up to that time there had been a shortage of 200,000 head of sheep at the five principal Western markets, as compared with the same period in 1906.

In 1894, the range of prices for native sheep in Chicago was from 60 cents to $5.40. In 1906, it was from $2.75 to $6.35. In 1894, the bulk of natives sold from $1.50 to $5.00. In 1906, they sold for $4.50 to $5.75. The range of lambs in 1894 was from $1.00 to $6.00. In 1906, it was from $4.00 to $8.50. These prices indicate not only increases in the value of the different classes but a narrowing of the range of prices raising the lower limit much more than the upper. This would indicate one of two things, either a greatly increased demand for the poorer grades of sheep or a decided increase in the quality of sheep marketed. It undoubtedly must mean the latter, as the demand would be felt for the better grades always stronger than for the poorer ones. Another change in the market conditions is the decrease in the average weight of the sheep as marketed. In 1894, the average weight of wethers in Chicago was 89 pounds; in 1906, it was 81 pounds, the lowest average during the time. This would indicate the marketing of sheep at an earlier age. The nearer a sheep weighs to 100 pounds the better it will sell on the Chicago market. A greater profit may be had in marketing the lighter sheep, because of the diminished gains as the animal reaches maturity.

It is quite desirable that a person engaged in the sheep business should have some fondness for these animals. While the labor of sheep husbandry is not heavy, it requires watchfulness and care. It requires much more care for the raising of hogs or beef cattle. A person who engages in the sheep business must be willing to make sacrifices. During the lambing season he must be willing to get up in the middle of the night and visit the fold in order to see that everything is correct. He must be on the outlook for stray dogs, and on this account is not always fully appreciated by his neighbors. It is probably more essential in sheep husbandry that a person have a natural liking for his charges in order to succeed with them than in any other class of animal husbandry. Sheep have their peculiarities, which, if not understood and appreciated, would in a very short time disgust and discourage one who is unused to them and has no liking for them.

Sheep are so radically different from hogs or cattle that it is necessary for a person to have some particular knowledge and interest in order to gain the highest success. Farmers and feeders who have been successful both with cattle and swine have been total failures when handling sheep. The more nervous disposition the greater timidity, the tendency to stampede, and the disposition to give up when in trouble render them decidedly peculiar animals to care for. It would seem that a sheep has less common sense than any other animal. It is the most helpless under adverse conditions, yet one of the most thrifty when properly handled. It is the most sensitive to its environments. A man who enters the sheep business will usually do well to begin on a small scale and increase his flock as his knowledge of their habits and his interest in them grows. Careful shepherds and flock masters are even harder to find than herdsmen. For this reason in this country the owner will have better success with sheep if he cares for them in person. The most successful flock masters are usually those who have grown up in the business. In England, the original home of all our mutton breeds, the position of shepherd descends from father to son, from generation to generation. In this country the best flocks are generally the ones that have been in one family the longest.

The average man starting into the sheep business would better buy a breeding flock of grade ewes of the type desired, rather than attempt to begin with pure bred animals. It is the general opinion that in this State he will find it more profitable to keep a breeding flock of grade Merinos with which he uses a ram of some of the mutton breeds, than if he attempts to handle a single breed, except where he raises breeding stock. This gives an opportunity for the production of Merinos on the one hand and sheep of some of the various mutton breeds on the other. Delaines and Ramboullets would be preferable to the so-called American Merinos for this purpose. They have the advantage of larger size, smoother body, and better mutton type. It would be left to the individual taste of the farmer whether he should choose Shropshire, Southdown, Hampshire or some other breed to cross with his Merinos for the production of market sheep. In general, a man will succeed best with the breed which he likes best. He should select the one which most nearly meets his ideal, provided at the same time there is the market demand for it. He cannot afford to educate the market. It is safer to produce what the market demands than to try to make the market take what he wants to produce.

The Merino blood in the ewes will give them sufficient fleece so that the wool will pay for their keep and the lambs be produced at a profit. It will also give them greater hardihood, make them better milkers, and more regular and earlier breeders. The Merino blood will give rustling qualities and make the sheep more able to shift for themselves, and will enable them to consume a larger proportion of coarse roughage. The blood of the mutton breed will give the mutton form, the fattening qualities and early maturity.

The necessity for using pure bred sires, although grades are to be produced, should not be overlooked. If animals are desired carrying three-fourths the blood of one breed and one-fourth of another, it is much better to use a half-bred dam and a pure bred sire than to have both sire and dam three-fourths to begin with. In the same manner, if half-bred animals are wanted, it is better to use two pure bred ones. The transmission of characters when both parents are of mixed breeding is too uncertain. When one of the parents is of pure breeding it will be much easier to predict what the offspring will be. We have not reached the state of knowledge of breeding or heredity, which will enable us to tell with any degree of certainty what the offspring of the second cross will resemble. Mendel's law seeks to forecast this in certain instances, but this law itself is rather vague. The offspring of a pure bred mutton ram and half-bred or three-quarter bred Merino ewes will sell almost as well on the market as lambs or wethers of the pure mutton breeds, and can be produced more cheaply.

In order to get the best selling lambs from grade or cross bred Merino ewes it is very important that the ram be of decided mutton form. It will be necessary for him to have character and prepotency to overcome the defects of the ewes. The mutton type of sheep can well be compared with the beef type of cattle. It is essential that the animal have broad, strong back, well sprung ribs, deep and thick thighs, broad, deep chest, and present a compact form of body. The back and hind quarters of the sheep are the highest in price, and therefore it is the butcher's desire that these be as strongly developed as possible. There is not quite so close discrimination between the types of sheep as between the types of cattle. In the first place, on account of the heavy covering of wool it is not possible for the buyer to judge so closely of the type, and in the second place, fatness is relatively of more importance in marketing sheep than in marketing cattle. In the Chicago market all sheep are classed as lambs until they are about a year old, or until they have shed their first teeth. From that time until they have shed their second teeth they are known as yearlings, after that as sheep. The bulk of the yearling wethers, unless too heavy, are killed and used as lambs, but yearling ewes mature earlier and cannot be used in this way. They will not break what is known as a "lamb-joint," that is, a square joint in the fore leg. Yearling wethers are used for lambs when they weigh not more than 90 to 100 pounds. When they get past this weight they must be sold as mutton. Very few range lambs are fed in Pennsylvania. Quite a number of range lambs reach the Pittsburg market, but practically all are fed in Ohio. There may be profit in feeding range lambs in Pennsylvania, but in general it would seem that the future of the sheep business is most promising for the farmer who raises his own lambs and markets them either from the ewes or after winter fattening.

Fattening lambs in winter do better in rather open sheds than in close stables. If they can be protected from strong winds, rain and snow, it is all that is necessary. They require even less shelter than fattening steers, on account of the coat of wool. Some experiments indicate that it is an advantage to shear the lambs before putting on feed; others that it is a disadvantage. It probably depends upon the quarters and the time of the year they are fed. Shorn lambs will always be discriminated against in the market, so that nothing is gained from marketing the lambs and wool separately. If the feeding period is to extend into warm weather it is better that the lambs be shorn. If they are marketed while the weather is yet cold the wool should be left on them.

For winter fattening it seems that no feeds have been found so satisfactory as corn and clover or alfalfa hay. The results of experiments in Michigan, where corn was compared with a mixture of corn and oil meal, corn and wheat bran, and corn and wheat, are given below. The results of an Ohio experiment, in which corn was compared with a mixture of corn and oil meal, and corn and cottonseed meal, are also given:

	Grain.	Gain per day. Pounds.	Grain per 100 pounds of gain. Pounds.	Hay per 100 pounds gain. Pounds.	Cost of 100 pounds gain. Dollars.
Michigan.	Corn,	.31	481	335	4.60
	Corn, 4 parts, Oil meal, 1 part,	.34	486	323	5.10
	Corn, Wheat bran, Equal parts,	.25	638	420	5.30
	Corn, Wheat, Equal parts,	.28	503	380	5.40
Ohio.	Corn,	.30	402	504	4.91
	Corn, 5 parts, Oil meal, 1 part,	.30	397	497	5.31
	Corn, 5 parts, Cottonseed meal, 1 part,	.31	388	486	5.14

In the Michigan experiment, clover hay was used for roughage during the entire time. In the Ohio experiment clover hay was fed about one-third of the time and alfalfa the remaining two-thirds. These were alternated to give variety to the diet. There was some blue grass in both the clover and the alfalfa. In these experiments it is seen that while the gains on corn alone were no better, and in some cases not so rapid, as on mixed grains, the greater expense of the mixed ration made it less profitable. In the Ohio experiment it was found also that the shrinkage in shipping was less in the corn-fed lot than in either of the others, and the percentage of dressed carcass to live weight was greater. This shows a threefold advantage in favor of the corn ration. Oats may be fed for the sake of variety, but experiments show that as a steady feed they are not equal to corn pound for pound. The corn would be best shelled but not ground. In feeding hay the racks should be so arranged that as small an amount of dust and leaves as possible may get into the wool. Sheep should never be fed from overhead racks. The sides of the rack should either be vertical or slope away from the sheep at the top. Sheep should not be fed any more hay than they will eat up, as they are dainty feeders and will not eat hay that has been mussed. Beginning with lambs weighing 60 pounds and feeding until they weigh 80 pounds, a gain of two pounds per week would require 10 weeks or 70 days. They will eat during that time an average of two and one-half pounds of feed per day. The proportion of grain to roughage will vary somewhat. When the roughage consists of alfalfa hay, a smaller proportion of grain will be required than if some other form of roughage is used. Silage has been used to some extent for sheep feeding, but the results have not been uniformly satisfactory.

Sheep resemble cattle somewhat in their digestive capacity, yet have some essential differences. They will not eat as coarse quality of dry roughage, yet they are more liable to grind their grain, and they digest their feed more closely. If fed corn stover, the sheep will not eat so much of the stalk and pith as the cattle will. If crushed ear corn is fed, the sheep will pick out the grain and leave the cob.

In fattening sheep, the cost of the feed required to produce a certain gain is usually less than the selling price. In fattening cattle it is usually greater. The cattle feeder usually counts on a margin of a dollar and fifty cents per hundred weight to show profit. The sheep feeder will have a greater profit at a smaller margin.

The time at which the lambs should be dropped will depend upon the time they are to be marketed. If marketed directly from the ewes, the earlier they are born the better. If intended for winter feeding, they need not be born until the ewes are turned on grass. In fact, it might be more profitable to have them come in May than in April. Early lambs should be taught to creep as soon as possible and be given feed where it will not be accessible to the old sheep. Late lambs will need no grain until the fattening period. They may run with the ewes, provided these are on good pasture, or they may be turned in pasture to themselves a few hours each day. The lambs are usually weaned at four to five months of age.

Where permanent pastures become infested with intestinal parasites, it is sometimes necessary to sow special crops for the lambs and wean them early. Of the special crops, rape is probably the one most commonly grown. Even where parasites are not found, it is often advantageous to have a small plot of rape to supplement the regular pasture. It may be grazed continuously or the sheep may be hurdled on a part at a time. When the sheep are turned out the rape will grow up again very quickly, provided the weather is favorable. It will continue this until freezing weather. In pasturing on rape, it is necessary to watch the sheep rather carefully for bloat. At first it is better to turn them in for a few hours during the day. If they can have rather dry, blue grass pasture to run on at the same time they have access to the rape, so much the better. Soy beans or cowpeas would also be satisfactory as sheep pasture, but the length of the season through which they might be used would be much less than that of rape. Rye and wheat are most excellent early pastures. It is recognized that cattle do not do well on the same pasture as sheep, particularly if the pasture is somewhat close. The sheep are inclined to crop the pasture closer, and eat out the fine portions. They run over the pasture and trample over the better grass, making it unpalatable to the other animals.

The two greatest enemies to the sheep industry are internal parasites and dogs. In this State probably the *Canis familiarus* does more damage than all the "*Strongyluses*" and "*Tenias*" combined. The dog question is undoubtedly a serious one with the sheep men. In some parts of Pennsylvania, where at one time sheep were more numerously kept than in any other part of the United States, the business has been almost entirely killed by the development of the mining industry, with its influx of foreigners with their dogs. Pennsylvania probably has as good a dog law as any state in the Union, yet the laws are not sufficient to protect the sheep men. Their execution involves too much disagreeable work and too much red tape. It is safe to say that three-fourths of the dogs in this State are absolutely worthless, yet it would probably be impossible to go out and kill a single dog without offending some one. The number of dogs which no one owns when the assessor comes around is usually much larger than the number which have acknowledged owners. Yet kill one of these dogs, and the owner very promptly appears. The sheep man must, to a very great extent, take the execution of the law into his own hands. While the law does not permit the placing out of poison, it would seem that in many cases this would be justifiable. In keeping a few sheep it is not possible for the owner to be in sight of them at all times. Yet there is not an hour during the day or night that they are safe. The dogs turn up at the most unexpected times, they may come singly or in droves. Usually they come in droves and begin by chasing the sheep for fun. The result is inevitably either dead sheep or dead dog.

One thing which seems to indicate greater profits in the future for the Eastern sheep men, is the decreasing numbers fed on screenings near the large Northern flour mills. A few years ago great numbers of Western lambs were shipped into Minnesota, Wisconsin and Michigan, and fattened on screenings from large flour mills of that region. This proved to be a very profitable business, and the increase was rapid. The price of wheat went up, and the millers seeing the greater demand for screenings, immediately raised the price of this feed, which has greatly cut down the profits of the feeders. Probably the using of screenings in making many forms of mill feed and various stock foods has also contributed to an increase in price. At any rate the business of fattening sheep on screenings will probably never be as profitable as it has been in the past. With the increased cultivation of alfalfa in Pennsylvania, the sheep business will also be made more profitable. Alfalfa undoubtedly forms the best roughage to be had for fattening and growing sheep. The lambs fed in Colorado, Nebraska and Wyoming are fattened almost wholly on alfalfa hay. More alfalfa in Pennsylvania and higher prices for it in the West ought to help bring the sheep business this way. Further, the way the sheep business is being conducted on the range, it can't last always. The range itself is being taken up by settlers, where not taken up by the pasturers, are so overloaded that the native vegetation is being rapidly killed out, and no method has yet been discovered for renewing it.

PRACTICAL POULTRY KEEPING FOR PENNSYLVANIA.

BY MR. W. THEODORE WITTMAN, *Allentown, Pa.*

It would seem, after the great mass of matter being published monthly by the poultry press of this country, that there was little or nothing to be said along the line of "practical poultry keeping."

And as far as practical poultry keeping for Pennsylvania is concerned, I should say at once that it differs little, if at all, from practical poultry keeping throughout the Northern and Eastern states.

However, towards the end of this address, I shall endeavor particularly to emphasize the most neglected essential points in practical or successful poultry keeping in this state.

For practical poultry keeping is successful poultry keeping. Much evidence along this line exists. But in the same breath I might here say, scientific poultry keeping is not successful poultry keeping. Much evidence also exists to prove this. Science as applied to the farm and to some branches of live stock has proven its worth and is successful.

Probably this whole body of agricultural experts here gathered could stand up and individually give instances of the worth of science as applied to farming; as applied to feeding and housing dairy cattle, for instance. But who can here quote me a single instance of a successful scientific poultry plant?

True, every little while some fellow will get off a series of articles in some poultry journal on scientific feeding (balanced rations), or on some complicated scientific system of ventilation, etc. But do you know it's all on paper? It's a fair chance the writer has half a dozen chickens on some back lot, receiving enough care and attention which, if it had to be paid for, would run up to $10 or $25 per individual hen! Or, worse yet, these scientifically fed or attended hens would be a sickly unprofitable lot. No! No! this is not practical poultry keeping.

What, then, do I consider the essentials of practical or paying poultry keeping? Poultry keeping in this State. But just a word more until we finish the scientific end of the subject. Who, if any one, are we to look to for proven scientific worth in poultry keeping? If not to our government bureau and State agricultural colleges, to whom then? Yes, the government and at least half a dozen states are working along the poultry lines. What are they doing? Not much.

Principally they are frittering away their time and our money, for instance, in egg tests. Tests to see which breed or variety will with them, prove to be the best layers. I say "with them," for many things may go to prove that with them so-and-so breed or variety are the best layers. But does that add a single scientific fact or give us a single fact of value? Hardly.

Now, every practical or successful (the two words this morning are inseparable) poultry man knows that a certain family or strain, say Langshans or Brahmas, may outlay a certain family or strain of Leghorns. Climate, feed, care may even emphasize this. It may work, too, the other way.

But no amount of research by State colleges will change the unalterable fact that the smaller breeds like the Leghorns, etc., are the layers.

The Maine State College is doing a great deal better. They have put in a series of years trap-nesting their hens, breeding and establishing a line of layers of a given variety. This at least is something intensely practical (profitable), if not scientific.

MAINE DOING WELL

Now, some real scientific work would be to search in the egg why and wherefore of its fertility or non-fertility.

To give us some definite light on the plague of white diarrhea, which kills its tens of thousands of baby chicks yearly: or to help to combat the gape worm pest. The gape worm lowers the value of the poultry products of this State, if you take this county as a ratio, perhaps $100,000. To be intensely practical, one should work such things out by observation or as he goes along. Science must and eventually will come to his help.

Now, what is practical (successful) poultry keeping? A mighty elusive thing. A thing it is fair to say 999 men out of every 1000, who go into the poultry business, fail to grasp. A man who knows nothing of commercial life may take hold of a large commercial enterprise and spell success. He may go into mining or manufacturing and make good. But who can, without the knowledge gained by experience, go into full-fledged poultry keeping and make a success? Such men are a little tiny more plenty than hen's teeth. A few, a very few, have done it. You must, in the poultry business, begin at the bottom—begin in a small way.

DIFFICULTIES GREAT.

I am not exaggerating the difficulties. The fact that the average life of a poultryman does not reach three years goes a great way to prove it. The scores, the hundreds, of large abandoned poultry plants all over this country help my assertion along.

Forgive, then, the veteran poultryman concerning the attitude of the average American citizen towards the poultry business. So big! So easy! So much money in it! Some day I'll try my luck at it. But the funniest thing of all to the seasoned poultryman is the sublime confidence of the average man in his knowledge of how to make a success in the "hen line." He reads every scrap he comes across pertaining to chicken subjects. I say he reads it, but he doesn't digest it. Much of it, though, is utterly indigestible, swallowed even with mica grit or any other hard granite grit, because written by men (and, softly, women), who have acquired just that little knowledge which is a dangerous thing. I could entertain you for the rest of this day with personal experiences of how this works out. Let me give you the first one, as I member it in my experience.

A TYPICAL EXPERIENCE.

The man was a German, not many years in this country; thrifty and enterprising, owning his own little farm. One day he read in a farm paper that hens to lay must have exercise. Now, picking out English words was slow work with Fritz, besides, what he had read had given him an idea. "Hens to lay well must have exercise." Next morning he cut two ten-foot poles in the wood lot, and, calling his two boys, he handed each a pole and told them, "Boys, dose hens must have exercise to lay much eggs. You chase them over this four-acre field one hour every day."

Or, later on in the summer, when a plague of red mites in his hencoop nearly drove him distracted, he readily decided to act on some advice he had also read. "Empty the nesting material and pour coal oil over the nest boxes and roosts and set on fire." Fritz overlooked the essential of removing the nests and roosts out of doors, and set them on fire where they were.

You may laugh. Time and again have I given advice to people seeking it concerning something needing righting with their poultry, and they did just as crazily as Fritz did, or worse; and if they did not burn down their coop, they wound up their chickens.

THE ESSENTIALS.

Now, in a nutshell: I have not entertained the thought of telling you in one short hour how to make a success of the poultry business; but I will in a very few words endeavor to tell you how Pennsylvania might have more success, make more money, with their poultry.

First. Change the stock; change to pure breeds, or at least change to pure-bred males. Fight shy of cheap stock, especially if you are a beginner, fight shy of cheap stock. That word "cheap" more than all other things together spells failure for perhaps as many as three-fourths of the beginners. You cannot buy good poultry cheap any more than you can buy good clothes cheap. When you pay shoddy prices you get shoddy goods. When you pay fair prices you get a good serviceable suit. And when you pay a fancy price you get a dress suit. All of which applies exactly to poultry. If you want to get a good serviceable stock, males, for instance, you must pay at least $5 each. If you want a fancy bird you must pay $100, and perhaps $500; and, by the way, you will find more trouble in buying a $500 bird than a $5 one. But the $5 one will, or should, answer all practical purposes. You can't make a success with poor indifferent stock.

Second. Better poultry houses. Note that not enough money is spent in the average Pennsylvania poultry house. But they are planned wrong, built wrong, situated wrong, and wrong as wrong can be. The ideal poultry house wants all the sunshine and fresh air possible; wants a tight roof, and, if possible, tight walls north, west, east, and it does want to face the south or southeast, and not be situated in a depression. If you leave the south side wide open the year round you are pretty near right.

Third. Better feed. Less corn, more meat. A year ago when on this platform I spoke on "Why Lehigh County Farmers Are Not Getting More Eggs," I was told I must have it in for the farmers. But I fear if I was to give you my straight opinion of the usual city "fresh eggs," filthy farmers' eggs would seem clean in comparison. Milk from garbage-fed cows is condemned by common sense, by the medical fraternity, and by the laws of this State. What about city garbage-fed hens? A hen will eat unutterable garbage, garbage the dirtiest cow would not touch. And what about the eggs laid by the tubercular hens, so common in the city back yard? And the liver sick hens?

Fourth. More room. Less tainted ground. Less sickness. More vigorous, more hardy, rich, red-blooded stock.

Four simple things which, if you men are leaders in the agricultural thought of the State will emphasize on all possible occasions, will go far towards better poultry keeping.

A gentleman, Mr. Allen, one of the largest dealers in the city, handling about $300,000 worth a year, told me two years ago that he had an acre of ground on his place, on which he was keeping a hundred hens, and was selling a hundred dollars' worth of eggs a month. Now, if any of our farmers can produce a hundred dollars' worth of eggs in a month from an acre of ground, I would like to know it.

Now, my reason for taking up your time, gentlemen, is this: I am a member of this Board in the interests of the Poultry Association, and if I do not say something I shall feel as if I have not done my duty by those who sent me here, and for that reason I ask your indulgence for a few minutes.

The census report of 1900 tells us that in 1900 1,981,699 cows, valued at $566,375,739, produced $472,276,293, or a value per cow of $29.68, and of dairy products, $24.75 per cow, or 84 cents for each dollar of the cows' value. At the same time there were in this country 250,681,673 chickens, producing 75,783,596 dozen of eggs, and their product was worth $281,178,035, or an average value of 29 cents, making the average product of each chicken worth $1.12, or $3.27 for each dollar of value. There is $3.27 per dollar for money invested in chickens, against 84 cents per dollar invested in dairying. Now, that is taken from the United States statistics.

Now, then, we take into consideration the small amount of ground that is necessary to support these millions of chickens, as compared with the ground required to support dairy cattle, and we see the gain there, as well. Then, they require only about one-tenth as much expense for feeding and housing as dairy cattle, and our profits are accordingly increased. The hen takes care of herself. Now, each egg is worth at least two cents, and a hen will produce at least a dollar's worth of eggs a year.

Now, Mr. Wittman has told you—and there is no question about it at all—that there is more nonsense written and put into poultry papers than on any other subject. Now, I do not mean to say we must not read poultry papers; but we must learn to distinguish between the sense and the nonsense.

Poultry keeping has never received a proper amount of attention, and is therefore not considered—and wrongfully so—as important a feature of farming as dairying, or some of the other branches. I think the Farmers' Institutes should make it one of their most important topics, and arouse the interest of the farmers in this remunerative occupation, and I hope they will not fail to do so during the coming year.

WHAT SHOULD BE THE QUALIFICATIONS OF THE STATE LECTURERS.

BY A. L. MARTIN, *Director of Institutes.*

Gentlemen of the Farmers' Institute, Managers, Lecturers and Friends: Our good Chairman has just slightly misapplied the topic assigned to me. That is the subject of Brother Glover's address, and it is very much more pleasant to have the other fellow explain the qualifications of an Institute Lecturer.

The few words I have to offer at this time might be summarized by saying that the Department of Agriculture has taken no backward steps in the last decade. If I could place before you on canvas the agriculture of ten years ago, and that of today, the stages of advancement would be very clear. Then the soil was regarded as dead, inert matter; now it it known to be an active, a living reality, subject to changes in organism, due to our treatment of it, and responding with increased production to intelligent care. We have also the improvement in other lines of agriculture, the dairy cow. Then the scrub cow was practically the only thing known to the farmer; today we have the fine-bred dairy cow, with her physical system developed for special purposes, and selected for her productive capacity, gradually evolved by the brain power applied to the theory of selection, as developed in the last ten or twelve years. The same rule applies to poultry keeping. Note the pure bred stock of today, selected in like manner with reference to the profit to be derived therefrom, and with the laws of breeding and selection worked down to a nicety and followed out. What a difference between this and the poultry keeping of ten or twelve years ago, before the Department of Agriculture began its aggressive campaign by the organized Farmers' Institutes! Again, one of Pennsylvania's great interests, horticulture. Yesterday we heard Dr. Funk tell us how climatic influences and all the enemies that beset the grower of peaches, can be overcome so as to produce even in an off year—but we know no more off years, thanks to the advancement in this line—we now have a full crop of peaches, where, under the old regime the peach trees were often destroyed altogether by unseasonable weather.

All this advancement, and many others along these lines, has been worked out on these fine old farms of Pennsylvania, largely through the instrumentality of the Farmers' Institute of Pennsylvania. Every farmer, every delegate, here knows this to be true. Other agencies and instrumentalities, which have given important assistance in improving agricultural conditions in Pennsylvania, are the Pennsylvania State Board of Agriculture, and the agricultural papers and the Agricultural College of Pennsylvania are all doing a great work, and are a power for good in the cause of agriculture, using their influence and experiments to induce the people to adopt modern machinery and improved methods on their farms, but their results are extended to the people through the Farmers' Institute, and the results, we are sure, will more than justify all our past troubles.

I am glad today to have an opportunity to listen to this discussion by the Managers and Lecturers of the Institutes. I expect to learn a great deal; and while you have accomplished much in the past, there remains still greater things to accomplish. Our sun has not reached its zenith.

The discussion this afternoon is devoted to questions relating to the work of Local Managers, and the Farmers' Institute Lecturer. I want to take a few notes from you men who have been out in the field everywhere in Pennsylvania. I want your counsel and your advice. Do not hesitate to speak out in this Convention; you can't offend me by so doing. Our object is the improvement of agriculture, and we want to leave no means unused leading to that end. I hope every delegate will take an active interest in it, and help to make the discussions lively and interesting.

Mr. Hall has been called to leave us on account of home conditions. His subject was No. 6. I would suggest that we hear him first, in order that he may be able to leave on the afternoon train.

I thank you, my friends. I cannot find it in my limited vocabulary of language to express my appreciation of the unanimous support you gave me in reference to my reappointment to the position I hold, and can only add that I will try to deserve your confidence.

IS IT THE DUTY OF CHAIRMEN TO ATTEND ALL MEETINGS IN THEIR COUNTY?

By HORACE H. HALL, *County Chairman, Potter Co.*

Mr. Chairman and Members of the Institute: The question assigned to me is, "Is It the Duty of Chairmen of Institutes to Attend All Meetings in Their County?" and I will say to you that I can answer that question in just one way, and that way is "Yes."

I cannot conceive of any reason why the Chairman should not be present. Now, the Manager of the Institute is the representative of the Director of Institutes, and he should be present to pay his indebtedness to the Superintendent. I don't see how a man can be a Chairman of Institutes in his county, and not know exactly what is going on for the advancement of agriculture, and what is being done at the Institutes. Now, when I came into the position of County Chairman I was a fairly well privileged man in Pennsylvania; but suppose I had been an average farmer in Pennsylvania taking the position, what would the State have done for me to pay me for the time and trouble of attending these meetings? It would first have paid my expenses to Huntingdon, then to Harrisburg—I have not got them in order, but it is close enough for all practical purposes—then to Bellefonte, I think, to State College, then to Harrisburg, and then here. I hear some of the Chairmen say we should be paid for our time. If it is not doing our own work to work for the farmers, and go to these Institutes to get inspiration for the work, and get information, which will be for our own benefit, I don't know what would be the use of living. I think we are well paid for all that we do to make these Institutes what the Department of Agriculture wants them to be—Schools of Agriculture, which will lift the entire agricultural interest of Pennsylvania.

WHAT SHOULD BE THE QUALIFICATIONS OF THE STATE LECTURER?

By J. Newton Glover, *County Chairman, Union County.*

By qualification we understand "any natural endowment or acquirement which fits a person for a place or employment."

A good constitution or fair health is one of the first qualifications necessary for a state speaker to have, in order to stand long or cold drives, change of rooms and beds, loss of sleep, speaking in heated and crowded halls with poor ventilation, all of which go with their work. With this constitution should be a voice strong and distinct enough to be heard in all parts of a hall or church, with variation enough in tones to keep people awake and interested, unless the subject is too dry or scientific for the average person, and the ventilation too faulty.

The social qualifications of a speaker are important in helping one to make friends with his host and fellow-speakers and hearers before and after sessions, and in finding out the needs of the section in which he is laboring, and how he may help them. He should be able to deny himself the conveniences of town and city life, if necessary, in the country, when he is given the best people have, and not be disagreeable if asked to double up with a fellow-speaker in order to give both a warm room. We mention this qualification of accepting situations agreeably on the part of speakers, because some men think that the best entertainment people give them is not good enough, since the State pays for it, though it is some better than they have at home. A State speaker needs the working quality when it comes to answering questions, both in and out of institutes, so as to clear matters in the minds of farmers upon questions they are trying to solve on their farms; and speakers need the staying quality also, so that they are at the institute to the close of the session, if necessary, to answer questions which may arise, instead of trying to get away to read, write or smoke, or so they will not be interrogated or asked to explain more in detail the questions they discussed. Punctuality, of course, is necessary in this work, as elsewhere, for it will not do for a speaker to be late in getting to the hall in time for his talk, or to miss connections and not reach the place till the session is nearly over, as has happened a few times with the speakers for our institutes. Energy and enthusiasm on the part of speakers are necessary to be successful, because when a speaker shows by his talk that he means and believes, and has done what he is saying, his hearers will accept his statements; whereas, if he is easy-going and tired, his audience will become tired of him the longer he talks. The life of a speaker is a strenuous one, which no lazy man, or one who has failed as a farmer, should covet; but a man may be a "crank" on some subject which he knows and has worked out successfully on his farm or plot, and be a good institute worker, provided he is not too cranky on every subject to be useful.

The literary qualifications of a State speaker cannot be too high or great, if he has sense, experience and observation with them. Many of our practical and successful farmers have not had the educational advantages they should or would have liked to have had. Yet they succeeded in some branch or line in agriculture along which they read, studied, experimented and observed, till they mastered the subject and became specialists in their work. If a man has grown corn, wheat or potatoes, been a trucker or fruit grower, or raised horses, cattle or hogs, or has been a successful dairyman or poultryman, so that he is recognized as the best authority in his line in that section, and can tell others what he knows in good language, and is a man of good character, he has the qualifications for a State speaker. Because a man has read much on agriculture, and is full of theory as to how things can or should be done, even if he is a good talker, does not fit him for this work any more than a clerk, agent or political farmer with a "pull" is fitted, since such men destroy the usefulness of institute work, and never should have any consideration as State speakers. What people want to hear of a speaker is his experience and observation which enabled him to succed in his specialty, so that they may profit by his knowledge and success.

Granting now that a speaker has succeeded along his line, or knows the subjects he discusses; that he has lived on, experimented, owned or farmed for profit or pleasure, he should know how and where to begin his talks, and how to illustrate them, whether by drawings, figures or story, to impress his hearers, quit when his audience is getting restless or sleepy, though he has not said his whole speech, and not tell the same stories or present his subject in exactly the same way at every institute, that it will not be so monstrous to his fellow-speakers.

Another qualification of a successful State speaker is that he be a student and observer, improving himself, not going over the State talking on the same subjects from year to year, after his talks have been published by the Department of Agriculture, and read by many people who attend institutes; and he should adapt his talk to the section of the State he is in, and not tell farmers how to grow something for which their soil is not suited, or advise new things which have not been fully tested, though he may advise experiments. Some subjects may be discussed as "precept upon precept, line upon line'" till farmers hear and practice, but they must not be presented "with stammering lips" by speakers to be effective. State speakers must be honest, not exaggerate what they have done, or tell what they have not done; not to be too egotistical, must be sober men, and have regard for sacred things. The higher the morals of State speakers, the better, and how and where they spend the Lord's Day, will have its influence also with many people. Farmers who attend institutes are readers of agricultural papers like The Stockman, Agriculturist, Practical Farmer, Hoard's Dairyman, Breeders' Gazette, Rural New Yorker or other good farm journals, and are wide awake in their occupation; and these men are at the institutes to be instructed further by the State speakers, who are specialists in their lines, and supposed to be model farmers, with everything about their farms in good shape, so that visitors to their farms see them "practice what they preach."

You think these qualifications for State speakers are many and high, and so they are. Then, "Who is sufficient for these things?" Writers for the different agricultural papers are generally specialists in their lines, and many counties in this and other states have men who come up in a large measure to the requirements for State speakers, and these are the men who "will very gladly spend and be spent" to teach the farmers of this State how to better their conditions on their farms, so as to keep more of the industrious business young people on the "old homestead," and help the "man behind the plow" the better to hoe his row.

SHOULD COUNTY CHAIRMAN ACT AS PRESIDING OFFICER AT THE DIFFERENT SESSIONS OF HIS INSTITUTE? IF NOT, HOW SHOULD THE PRESIDING OFFICER BE SELECTED?

By Rev. T. J. Ferguson, *County Chairman, Cumberland Co.*

Mr. Chairman, Ladies and Gentlemen: I will answer this question by telling you what I have done, and giving my reasons for so doing. There was a day in Farmers' Institute work that a man could get up and make a speech, and that was all that was required; but that day has gone, thanks to our worthy Director. A man must not only tell a thing, but give his reasons for it, and I will tell you what I have done, and why I did it. In a meeting like this we do not expect every one to think alike, or to answer a question alike; but we come to tell one another what we have been doing, and compare methods, and thereby help one another to improve our work.

My plan has been not to preside when I could get some one else who was capable. You ask me why? Well, in the first place, I do not regard my appointment as County Chairman for the purpose of presiding at our local institutes, but for their direction and control. Our worthy Director, in speaking to us this afternoon, called us "Managers." I remember in his bulletin of 1906, in speaking of the Chairmen, and thanking them, he spoke of them as "Managers." Our duties are not specifically defined, but we are supposed to be fulfilling them when we set to work the greatest forces for good, and secure the greatest efficiency of the Institutes. And I consider that I have managed best when I have some one else to preside. I believe that it is well for the community to have one of their people preside. Then men, women and children know him, and it is the local man who will succeed best in arousing their interest. It is a source of local pride, and they feel at ease with him, and local people must be interested to make it go. Now, suppose the County Chairman, who is a representative of the Department, presides. The people are likely to reason that the State sends the speakers, pays the bills, presides and is the whole thing. By getting one of their number to preside, you show them that it is their Institute, and their local pride is aroused to make it a good one, and good to the community is the result.

My next reason is the good it brings to the man who presides. It gives him a recognition of his own power. It is an education and help that will enable him to come out and take part in other meetings, and I tell you that is what the farmers of Pennsylvania and of the United States, want—men who will be leaders of men. And one of the best ways these Institutes can be made a help to the different localities is by taking some worthy, capable young man to be the presiding officer. It will help him, and help those for whom the Institutes are held. A County Chairman can use his position to overshadow local men, and suppress them rather than call them forth and help them.

Now, that leads us up to the second question: "How to make the selection?" Well, I have always selected the Chairman of the local committee with this in view. This means a knowledge of the men in the county, and an acquaintance with their abilities. The presiding officer must be a man interested in agriculture—in touch with the fields. He must be a capable man, who has in his make-up three elements that I regard as essential to capability: 1. A good voice, that when he makes announcements he can be heard by the audience. 2. Self-assertion and force of character. Sometimes it is needed for those who talk too long, and take the time that belongs to others, spending time that could be used to a good deal better advantage. So he must be capable of calling them down, even if they are National or State Lecturers. Moody's success was largely due to his ability to handle men, and keep things going. It is related that at one of his meetings a good brother rose to pray, and kept on praying without knowing, apparently, when to stop. The audience began to get restless, and Moody said, "Friends, we will sing a hymn, until our brother finishes his prayer." We need a little of that self-assertion in the presiding officer.

3. A man who does not talk too much himself. Now, you say such men are not to be found. I have not found it so, and if you have, it seems to me that it is time for us to begin to turn some of our fellow-farmers to work just like this and train them. There is the program to guide him; there are the State speakers, who have the most kindly feelings towards any man who has anything to do with the meetings, and then there is the County Chairman to help him; with all these forces to assist him, the man will succeed, and he will grow. I am sure, my fellow-chairmen, that we are of one mind in wanting the best and wisest methods, that our Institutes may be made a great power for better farming, better men and better homes.

HOW MANY VACATIONS SHOULD OCCUR DURING INSTITUTE SEASON?

BY HON. T. J. PHILIPS, *Atglen, Pa.*

Mr. Chairman, Ladies and Gentlemen: If I were to answer this question from the standpoint of the Institute Lecturer, my answer would be very short. I would say, begin when the Institute season opens, and arrange for three weeks' Institutes and one week's vacation each month, until the season closes. I think I realize as much as any man can what it means at the close of one Institute to go on to another, in possibly another line of work. Now, we, as lecturers, have other business interests to look after as well. We are usually men of family, and need to look after our home and family life.

It has been said that the life of the Institute Lecturer is a strenuous one. We go out into the field, and we put up at all sorts of places—usually the best that can be provided for us—but often we are out of reach of communication from home, and we feel that matters should be so arranged that we could go home more frequently. On the other hand, I understand that every time there is a vacation, the Secretary is obliged to spend out of the money allowed him three hundred dollars for the transportation of the men to their homes. Therefore, that should be reduced to a minimum.

Now, I know that we usually begin about the first week in December, and then comes in the State Grange meeting. I doubt whether there is a man who recognizes the force for good of the Grange more thoroughly than I do, and that meeting is the very life-blood of the Grange. Then come the Christmas holidays, and that period has been set aside by the entire civilized world for a season of family reunions and festivities. That vacation comes just right, according to my way of thinking. Then comes the State Board meeting, the latter part of January, and then a period of hard work; for six continuous weeks last year some of us did not visit our homes. We drove over the mountains, and walked and worked until, if the whole thing became monotonous to us, is it to be wondered at?

Now, I have thought a great deal over this subject since it was assigned to me. I would not presume to dictate to the State Department how to hold their Farmers' Institutes, or to criticise in any way; but it has occurred to me that the abandonment of the Saturday evening session might be a partial solution of the problem. Often we find ourselves, late Saturday night, miles from a railroad, and from hotel conveniences, where we can brush up and rest up for the work of the following week. By doing away with the Saturday evening sessions, and curtailing the afternoon sessions, or letting the State Lecturers speak in the early part of the day, and filling up the later program with local talent, there are few sections of the country from which a man can't get home, if he wishes, for a day of rest with his home folks, and get back in time for Monday afternoon or evening. Very frequently the expense would not be materially greater than the cost of staying at a hotel, and many of us—I know that I, myself would, would be only too glad to go home at our own expense, if necessary.

Now, the time lost in this way could be made up by beginning Institute work a little earlier in the season, before the meetings of the Grange, the Stock Breeders' Association, the Dairy Union, and other similar organizations, and then running the Institutes along continuously, with as little interruption as possible, allowing the men to take more rest in that way. Where there are two experienced men, and one who is just being broken in, as is usually the case, the new man could be given a more active part in the work, and learn by practical work, instead of, as is too often the case, by observation alone. Now, I found this years ago, when I was traveling as a new man with Mr. Agee, and other old war-horses. The third man usually has a good time during the week, and then leaves early on Saturday for home, getting back Monday afternoon or Tuesday, as may suit his convenience. This would throw him on his own resources, and develop his abilities along the lines of Dr. Ferguson's talk. And, if more desirable, the Saturday evening session need not be abandoned in that way. He could be left in charge of it.

SHOULD OUR INSTITUTES BEGIN EARLIER OR LATER IN THE SEASON?

BY J. H. PEACHEY, *Belleville, Pa.*

Mr. Chairman, Ladies and Gentlemen: There are just two sides to my question—the earlier or the later Institute; I have my choice between the two, and I choose the earlier. I don't care so much when they begin as when they stop; and this, I think, should not be later than the first of March. March is usually a busy month with our people, and in many parts of the country the March public sales take away the interest of the people from Institute work. In many cases they are of more interest to the farmer than Farmers' Institutes. And in order to close our Institutes by the first of March, we should begin earlier in the season.

I might say something about these vacations. I know what it is to be out in the field for five weeks without going home, and I also know what it is to drag my weary length into some hotel late Saturday night, so tired that many a time I have never left the hotel all Sabbath day, until Monday morning came, and I had to renew my week's work.

In reference to the time of beginning, I want to say that what we want is to do the greatest good to the greatest number of people, and, no matter when you begin or when you end, you can't please everybody. Now, I believe it is the greatest number we should take into consideration, and I believe that our Institutes should be held at the time when the farmer has the least to do, and yet in time for him to apply that year what he learns; and I believe that if you leave the time of Institutes to the farmer man, he can better inconvenience himself to attend earlier in the season, and what will serve to help the greater number of farm people will serve to help the whole.

If we take into consideration the weather conditions, and the benefits to be derived from these Institutes, I would say that the earlier in the season we can begin after the summer's work is done, the better.

WHAT LEADING SUBJECTS SHOULD BE PRESENTED AT OUR INSTITUTES THIS COMING SEASON?

By **Prof. Franklin Menges**, *York, Pa.*

Mr. Chairman, Ladies and Gentlemen: I don't feel competent to answer that question, but it has occurred to me that cheapness of production and economy of production would be a very good idea to embody in the discussion. Now, I tell you, we have to do with the average farmer, and the average man; and when I say that I am not lifting myself above the average man; I am only an average man, and I sometimes question whether I am that.

Now, then, to illustrate what I am driving at—and when I say this I do not mean to discourage the man who is raising wheat; I am as deeply interested in the wheat production as any man, because I know that it is the grain, as Professor Owens told us last evening, of the civilized world. I know that means the increased production of wheat; but to illustrate what I am driving at, I will go right down into my own town. Winter wheat sells in my town at from seventy to seventy-five cents a bushel. Now, let a man take a thousand bushels of wheat to market, and it will amount to$700 or $725, and it takes first-class wheat to bring that price. Now, I believe that the average amount of wheat flour to the bushel is 60 per cent.; in Pennsylvania, I believe, it averages 71, but for the sake of a general average, let us say 60 per cent. Now, if a thousand bushels of wheat average sixty thousand pounds, and if 60 per cent. of that is flour, and at the rate of two hundred pounds to the barrel, it would make one hundred and eight barrels of flour. Now, that flour would sell in our town at $4.80 in sacks; in otherwords, that one hundred and eight barrels of flour was worth $744, or $44 more than that man got for the original wheat before it was made into flour. Now, out of that sixty thousand pounds of wheat, if thirty-six thousand pounds is flour, then twelve tons, or twenty-four thousand pounds is sold as bran and middlings, at the rate of $1 or $1.30 per hundred. Now, I don't know what you people do with your bran and middlings, but we sell them down there in our town of York, bran at $1 to $1.30, and middlings at from 70 cents to $1.16 per hundred.

Now, don't you see that the man who handled that wheat got more out of it than the man who raised it? Do you call that economy of production? I am not criticising; I am simply telling you. Now, a ton of wheat contains 240 pounds of protein, and 950 pounds of carbo-hydrates. Alfalfa contains 227 pounds of protein and 833 pounds of carbo-hydrates, or within thirteen pounds as much protein as wheat bran, and within ninety-seven pounds as much carbo-hydrates. Now, I passed last week up in York county, where they are just beginning to raise alfalfa, and I saw John Anderson, of New Park, York county, who has five or six acres of it, and his alfalfa is now twenty-three inches long. At the rate of a ton and a half to the acre, he will have more from his alfalfa than he will from his wheat, and have four times more food value. Now, I know a little about what it costs to raise this alfalfa; it will cost him about a dollar per acre to plow it, and a dollar and a half to harvest it, or about two dollars and a half an acre, and, with a ton and a half to the acre, you know just exactly what it will cost him. Now, if he makes it right, and at the right time, that six acres of alfalfa will cost him about fifteen or seventeen dollars. If you went into the market today for wheat bran you could not get four tons of it for less than eighty dollars, and he will get as much food value out of one ton of alfalfa as out of four tons of bran. That is what I call economy of production. I simply bring up this matter to make us think.

WHAT PORTION OF THE PROGRAM SHOULD BE FILLED BY LOCAL TALENT?

By Henry W. Northup, *Dalton, Pa.*

Mr. Chairman, Ladies and Gentlemen: The question assigned to me is one of the puzzling ones that comes up at Farmers' Institutes. Now, I am aware that there should be local talent on the program, but the puzzling part is the amount of it. Now, I went over to Lancaster county at one time to take part in a Farmers' Institute there, and I was delighted to go there, because Lancaster is a good place. When I got into town it was market day, and I found the farmers in their big hats lined up around the pavement, exposing their products for sale. Among them I saw something that was strange to me; I didn't know what it was; it looked nice, but that was all I knew about it, so I asked the farmer what it was, and he told me it was "smear-case." He had me there; it was an entirely new article to me. I told him there was a Farmers' Institute being held up there, and asked him whether he was coming. He told me "No; those fellows were all doctors, and lawyers, and preachers, and he didn't take much stock in them." Now, he was a Pennsylvania German, and I didn't know German, and I was afraid to tell him I was going to take part in that Institute for fear he might take me to be a suspicious character. I knew he wouldn't take me to be a preacher; but I was afraid he might take me to be a doctor, or a lawyer, or perhaps a saloon keeper, with myself for the best customer. Now, if there had been chiefly local talent on that program, no doubt that man would have been interested.

Now, this local talent question is one that can only be reached by the County Chairman or his executive committee. It is a question that comes right home, and it is not only a question as to how much of the program should be given to local talent, but what part of it. The average local speaker is self-conscious, and when the State Lecturers are put on first, he can think of nothing but when his time is to come, and wish it were over. It is hard for him to give that speaker any attention, or to learn anything from him. Now, if the local speaker is put on first, all this is overcome. He will feel at ease the rest of the meeting, and I would suggest that the first part of the program be given up to local talent, and let the State's men follow. It is the local affairs that make it of interest to the people there.

Now, I don't put it on all; but there are some of the State speakers who would do well to talk a little less; they start out, and they want to fill the entire program, and then the local man who is to speak begins to wonder where he is to come in, and if this is the way, he won't come next time. It does no good to put local talent on the program unless you see to it that they are given their time. If you get the local talent interested you have done much for the improvement of the work in that locality. I like to see a Farmer's Institute where the people lead and ask questions, and take an interest in the discussions. I tell you, if there is anything that will make an institute a success, it is to get local interest aroused. Let them run the Institute, but have your State's men ready to step in in case of an emergency. Many a time I have been to the Institute as a State speaker, and in the evening of the second day they would have the County Superintendent come in, and bring his teachers, and those interested farmers would sit down and have a good time, and it was not a waste of time, either. It might be more convenient to have these educational meetings at some other time, but let them have their own time; they are becoming interested, and the work will be a success.

OBSERVATIONS AND COMMENTS ON INSTITUTE WORK FROM THE LECTURERS' STANDPOINT.

By Robert S. Seeds, *Birmingham, Pa.*

Mr. Chairman, Ladies and Gentlemen: I want to say that I guess I am one of the best and oldest workers in the State of Pennsylvania, having been in the work for nine years, and in that time I have gone all over the State of Pennsylvania.

Now, when it comes to the point in question, what am I to say? I will try to go over the matter, and rehash what has already been said. First of all, I want to say that the Institute Lecturer who goes into the work ought to have his speech made of India rubber, so that he can pull it out or cut it down, or twist it into any shape to suit the emergencies of the occasion. Sometimes you have twenty minutes, and sometimes you have half an hour, and sometimes you have an hour and a half, and you simply have to adjust yourself to circumstances the best way you can. The Institute worker should have his speech divided into heads, and have it so divided that he reaches the climax at the end instead of the middle, as I have seen men do, and then flounder round without knowing how to end it.

I believe that every one will agree with me that we are all doing the best we can, but we don't all agree on what that best is. I hold in my hand here a copy of the speech of the President of the United States, delivered at Lansing, Michigan, on Memorial Day, and if you will read it you will find that the main problem to be solved is to hit something when you shoot. I have watched Institute speakers get up and talk, and everybody wondered what they were trying to get at. They didn't shoot to hit. They had not spent any time preparing that speech and getting it into shape. Very few men can talk without adequate preparation. I can't myself. It won't do to depend on the inspiration of the moment. Many a time I have gone to places, to gatherings where speeches were made, and when they called on me to make a speech I said, "This is so unexpected; I didn't expect to be called on to make a speech," when I had spent hours in preparing just that speech. But I tell you, my friends, that the best speech a man can make is when he is coming home from having made his first speech; then he thinks of all the things he could have said, and didn't. I have gone home after making my speech, and delivered it to the rafters to improve it. I am willing to improve. I would rather labor for a dollar and a quarter a day then for a dollar; and, better still, I would rather get a dollar and a half without hard labor. But now, to come to the point, as has been said before, a man, to be able to speak to the people, and teach them and interest them, must be full of his subject. If he is full of his subject, he will be able to say something about it, and only then.

Now, regarding the third man at the Farmers' Institute, put him on the program and help him along. Make him feel that he is necessary to the work, and he will become necessary. He may not be a brilliant success at first, but we must remember it is no easy task for a young man just starting out to get up before a lot of men whose hairs are white and tell them that some of the things they have been doing all their lives are wrong, and to impress them along the new lines of modern agriculture. I know that in the last nine years that I have gone over the State of Pennsylvania, I would like to hear some of the remarks that were made about me; I think I can tell you some of them. When I get hold of a new idea I want to hold it up until the man before me comes down, regardless of what may be said about me: in fact, I think there must be something wrong right now, because people are not talking about me.

And I want to tell you another thing, my dear friends. The farmers' Institute is in its infancy; but it is growing right along, and the Farmers' Institute of the future, when it is grown, will be a wonder. It will not only take in the country people, but the city man as well. Why, I was at a Chautauqua last summer, where one-half of the people were from the city, and I was afraid to talk, because my message was to the farmers, and the manager told me, "Don't be afraid; if you have anything to say, they will listen to you"; so I got up and spoke, and told them I would not be offended if they went out, but I noticed that not one of them went out while I was talking. We can't tell people anything unless we have a message, and I feel that I have a message to the farmer of Pennsylvania. I could make more money by doing some other kind of work, but I feel that I have a message to deliver, and so I go over the State and deliver that message, and I have faith that in the future that message will bear fruit. Some people say I tell too many stories, but I tell you right here that I won't talk to people when they are asleep; I'll wake them up.

Now, then, as workers in the Farmers' Institute field, let us go before the people with a message. Let us fill ourselves up with our subject, and tell them what we know. And another thing, do not let us go before the people with something some one else has said—and probably said better than we can say it. Work it out for yourself, and then tell it. The people will listen; there is nothing so successful as success.

These are some of the things I have observed in going up and down the State of Pennsylvania, and I want to thank the men who have worked side by side with me, and who have become close friends. We have stood by each other in loneliness and labor; we have told each other stories, and shared our experiences; we know what it is to be away from home, and I want to say right here that there are often hard things said of men who are away from home, but just you look over this company of handsome men here; you won't find a single one of them drunk; I don't believe a single one of them has seen the inside of a police station since they are here; and I want to say to you, you are the salt of the earth. That is what the President of the United States said out there in Lansing. You are engaged in a noble work along this line, and you will get better and better as time grows on, and as the Farmers' Institute expands. Don't worry about what people may say, but go ahead and deliver your message, and the results will come.

WHAT NEXT?

BY DR. THOMAS F. HUNT, *State College, Pa.*

I have been teaching school a good many years, and I have always made it a rule to try to teach as well as I could (which was never any too good), whether I had three students, or thirty students, or sixty students, so I hope that because the audience is not large, there won't any of you feel embarrassed about it, because it does not embarrass me.

Last week I spent the week at Lansing, Michigan, in connection with the celebration of the fiftieth anniversary of the Michigan Agricultural College. There met there the Society for the Promotion of Agricultural Science. Then there was held a meeting of the Association of Agricultural Experiment Stations and Agricultural Colleges, and there was the celebration of the semi-centennial services in connection with the fiftieth anniversary of the Michigan Agricultural College. There was present in the neighborhood of fifty or a hundred speakers on behalf of the man who lives in the open country, and, to cap the climax, the President of the United States came to Lansing and delivered an address on behalf of the man who tills the soil, and I have jotted down, to begin with, a few of the striking sentences in President Roosevelt's address, and by way of opening my address I will read these—a few of the striking and incisive sentences:

"We hear a great deal of the need of protecting our workingmen against competition with pauper labor. I have very little fear of the competition of pauper labor. The nations with pauper labor are not the formidable industrial competitors of this country. What the American workingman has to fear is the competition of the highly skilled workingman of the countries of greatest industrial efficiency. By the tariff and our immigration laws we can always protect ourselves against the competition of pauper labor here at home; but when we contend for the markets of the world we can get no protection, and shall then find that our most formidable competitors are the nations in which there is the most highly developed industrial skill; and these are the qualities which we must ourselves develop.

"Progress cannot permanently consist in the abandonment of physical labor, so that it shall represent more and more the work of the trained mind in the trained body.

"There is but one person whose welfare is as vital to the welfare of the whole country as is that of the wage-earner who does manual labor, and that is the tiller of the soil, the farmer. If there is one lesson taught by history, it is that the permanent greatness of any State must ultimately depend upon the character of its country population more than upon anything else.

"We cannot afford to lose that pre-eminently typical American, the farmer who owns his own farm.

"Everything should be done to encourage the growth in the open farming country of such institutional and social movements as will meet the demand of the best type of farmers. There should be libraries, assembly halls, social organizations of all kinds. The school building and the teacher in the school building should, throughout the country districts, be of the very highest type, able to fit the boys and girls, not merely to live in, but thoroughly to enjoy and to make the most of the country. The country church must be revived.

"Nothing in the way of scientific work can ever take the place of business management on a farm.

"But much has been accomplished by the growth of what is broadly designated as agricultural science. This has been developed with remarkable rapidity during the last quarter of a century, and the benefit to agriculture has been great.

"The prime need must always be for real research, resulting in scientific conclusion of approved soundness. Both the farmer and the Legislature must beware of invariably demanding immediate returns from investments in research efforts.

"Hitherto agricultural research, instruction and agitation have been directed almost exclusively toward the production of wealth from the soil. It is necessary, in addition, to adopt a new point of view. Hereafter agriculture will have to foster his social advantages.

"Book learning is very important (this is said by President Roosevelt, a Harvard graduate), but it is by no means everything, and we shall never get the right idea of education until we definitely understand that a man may be well trained in book learning, and yet, in the proper sense of the word, and for all practical purposes, be utterly uneducated; while a man of comparatively little book learning may nevertheless, in essentials, have a good education."

As I listened to these remarks, and to perhaps twenty-five other able, scholarly and scientific addresses—and I wish that these addresses might be read in their entirety by every man and woman in our land—I kept asking myself and other friends, "How can this wisdom be concreted in Pennsylvania?" How can it be made useful to the men of this great Commonwealth? How is it to be done? Now, then, what are the problems, and what are the first problems? What is next?

Now, I hesitate somewhat, ladies and gentlemen, in coming here to discuss this problem of What is next. Those of us who have gone to college will remember that a freshman is not expected to give advice. I have but recently come across your borders, and consequently have some hesitancy in standing here in my freshman year in this State to discuss the question of What is next. But, realizing the character of this meeting, and understanding that you gentlemen represent the agricultural leadership of the State of Pennsylvania, I have consented to come here and discuss this matter in order to get your point of view, quite as much for the purpose of giving you mine. I take it that you are all here as agricultural leaders in the State, and that this Institute is the agency which has survived and developed, and been grounded for some time, and which is to carry the work out into the field, and, you know, the stranger can often see the broken shutter on the house easier than the house owner.

The Commonwealth of Pennsylvania has developed into a great industrial organ, whose every member is dependent upon the healthy growth of every other member. Even a sore thumb may cause a great deal of trouble, especially if blood-poisoning set in—which, I understand, this great State is trying to probe by means of the probing committee. And there may be other things quite as dangerous as a sore thumb.

Now, we have no desire to glorify Pennsylvania, but the agriculture of Pennsylvania can hardly be considered apart from its great natural resources. In fact, its great deposits of coal and iron ore are of such vast importance that the greatness of its agriculture is often overlooked. I had occasion, at a recent meeting of the Pennsylvania State Board of Agriculture, to compare the resources, the agricultural resources, of this State with Nebraska, which practically speaking, has neither coal, nor timber, nor iron ore, nor gas, nothing outside of its agriculture to command attention. You think of Nebraska as a great agricultural state, and it is, and yet Nebraska is three-fourths larger than Pennsylvania, and its agriculture is, relatively, just about three-fourths as large as that of Pennsylvania.

In 1905 Iowa produced 14,000,000 bushels of wheat, and you are thinking of Iowa as a great wheat state—as one of the great granaries of the Union, and it is; but while Iowa produced 14,000,000 bushels, Pennsylvania produced 28,000,000—just twice the amount; and while the gross value of the wheat per acre in Iowa was ten dollars, in Pennsylvania it was fifteen dollars. There are eleven states that produce more bushels of corn than Pennsylvania, Iowa, for example, producing six times as much; but when it comes to the average value per acre of corn in these eleven states, the highest one is only sixteen dollars and a quarter, whereas in Pennsylvania it is twenty-one dollars. Illinois raises three and a half million tons of hay, Pennsylvania raises four and a half million tons. The value in Illinois in 1905 was eight dollars per ton; in Pennsylvania it was twelve dollars. In 1906 the average price of all staple crops in Pennsylvania was higher than that of the United States, with the single exception of buckwheat.

I do not make these comparisons for the purpose of making invidious distinctions between states. I simply call these things to your attention for the purpose of impressing upon you the greatness of the agriculture of this great Commonwealth of Pennsylvania, and the wonderful opportunities that are within her borders.

Now, what are the advantages in the State of Pennsylvania? Briefly, the soil and the climate in Pennsylvania is adapted to the growing of two things—trees and grass. These are the things for which the State of Pennsylvania is especially adapted. If you do not believe it, take a ride on the trolley cars, or on the steam cars, and observe the scenery. There are 28,000,000 acres of land in Pennsylvania; 5,000,000 are in crops other than grass; 23,000,000 acres in the State of Pennsylvania are either in grass land, waste land, timber land or city property.

What are the investments possible upon trees and grass, forestry, fruit-raising and animal and dairy husbandry. The forestry problem is one of the greatest national problems of the United States, and nowhere is it, perhaps, more acute, than in the State of Pennsylvania. The price of lumber in the United States, due to the increased consumption, is increasing 3 per cent. per annum. The transmission of the flow of water is another one of the Forestry Department problems. This is dependent upon the growth of trees, and it becomes a problem of constantly increasing importance. It has been already agreed that electric cars shall run from Niagara Falls to Albany, across the State of New York, and the motive power will be falling water. No coal, no oil, no gas, no wood, will be burned up. Why do we today enjoy luxuries not given to other generations? It is because we have harnessed coal and oil and gas to do the work, and what animals, coal, oil and gas do, man does not need to do. The high degree of prosperity of these states of Ohio, Pennsylvania, Indiana and Illinois, is in a large part due to the fact that we have large stores of fossilized carbon to draw on. Now, these states, which have these large supplies of coal, are the states which have wonderfully progressed and developed, and don't you see now that we are getting to this new point of view, or harnessing another natural agency—that of falling water for the new motive power? And in these two states of Pennsylvania and New York, where we have this flow of falling water, if this flow is maintained and converted into electricity, it will give us a great advantage over the states which have not this opportunity? And the day will not be far distant when you will be using this motive power on your farms.

While I am on this subject of forestry, I want to call your attention to the splendid possibilities in forestry. Last January we started a Department of Forestry at the Pennsylvania State College, and the first morning we had twelve students. I went into the Commissioner's office at Harrisburg not long ago, and he told me if we had twelve young men ready he would take every one of them, and last week at Lansing, Governor Pingree said they had twenty-six men now in their Forestry Department, and would take two hundred and sixty if they could find them.

Pennsylvania is the second horticultural state in the Union, citrous fruits excepted. What is of greater importance than the development of this opportunity which opens up before you? It may be doubted whether there is another state in the Union which is capable of raising apples of such uniformity and high quality as the State of Pennsylvania. The soil and the climatic conditions are adapted to the different varieties of fruits. The matter of fungus growths will require some scientific investigation, but I might say this to you, gentlemen, I have no doubt that methods will be devised which will thoroughly overcome them. There is a striking lack of knowledge of methods of fertilizing and cultivating that apply to the raising of trees. There has been a wonderful development of this knowledge in the line of wheat and corn, and it has brought results; but in the line of horticulture little or nothing has been done, and it is high time that something is done in this matter—and I am not speaking as a horticulturist, but as an agromomist.

Yesterday I examined, among others, a young Indian of Hindoostan, who had studied agriculture at the University of Calcutta before he came to this country, and I said to him, "You have been in this country two years before you came here. In these two years some questions must have come to you that did not come to your notice at home, when you left the University of Calcutta. Now, what striking phases or things have impressed you, as compared with what you knew before you came here." And he replied, without hesitation, "Three things. The first is your animal industry, including your dairy husbandry; that is one thing we know nothing about in India; the second striking thing is your application of machinery, and the third is the improvement, by selection and by breeding, of farm crops. Our farmers know nothing about that. These are the three striking things which impress me."

Now, gentlemen, here are three things which may well set the farmers of Pennsylvania and of other states thinking. They are the three most important factors of successful farming. First, is animal husbandry. This has already been discussed before some of you gentlemen, but, I believe a speaker said this afternoon, if you have a message you cannot repeat it too often, and I believe I have a message on this subject of animal industry.

Some of you know that it was in 1805 that the first cattle were driven over the Allegheny mountains, and from that day up to very recent times the eastern farmer has had to compete with the western farmer in the matter of live stock; but during the last few years conditions have gradually begun to change. The western farmer could pasture his cattle upon public lands at comparatively little expense, and during all that time you farmers of the east have suffered from lack of sufficient number of animals, because of economic conditions. Now, if I had the time, I could easily show you that this condition of affairs is passing away. The point I wish to make is that the western country has not been a cattle country because it is naurally adapted to the raising of live stock, but it has been a cattle country because it has been a pioneer country. The country west of the Mississippi, taking it in a large way, is not adapted to the raising of grass as is Pennsylvania, New York and some of the other Eastern states. These states are adapted to the raising of trees and grass, and the reason that the western country is a live stock country is simply because it is a new country. They can raise grain, but when it comes to the raising of grass and fruit trees, they can't do it. Take the State of New York. It raises one-seventh of the hay raised in the United States today. New York raises eleven and three-quarter tons of hay for each animal; Illinois raises three-quarters of a ton. You can take the State of New York, and divide it into three parts—one-third in pasture, one-third in hay and the other third in all other crops. Now, what does this mean? It means that when this country settles down to its normal condition, the eastern country will raise the cattle. It does not mean that the country will always be a dairy country. There are to-day thirty thousand hand separators in the State of Nebraska; the man in Nebraska has no grass, but he has corn, and he can feed his corn, and ship his butter to Philadelphia and New York, as they are doing in Minnesota and Nebraska today, while here you can raise sheep and cattle which do not require so much concentrate.

Now, this cattle raising in the East is very important on two sides. It is important, first, because this is a grass country, and, second, it is important because manure fertilizing means something to the eastern farmer, and perhaps in a different way than you think. I have taken land in New York that will raise a ton or a ton and a half of hay, and I have given it stable manure and commercial fertilizer and raised from three to four tons on it. I have tried it. I have also experimented in Illinois, where I know the land, as I said once before, as well as I know my own children, and I will defy any average land in Illinois, in any average season, to raise four tons of hay to the acre. What is the reason? It is due to climatic conditions. Where we can raise, with proper fertilizing, five or six tons here, we can raise two or three tons there, and to make our land fertile we must raise live stock. Put the fertility on the land, and raise cattle, and you will raise greater crops than can the Illinois farmer. Illinois is my native state, gentlemen, and I would not say a word against it for the world.

There is something about dairying that I want to call your attention to. Possibly Professor Van Norman has already called your attention to it. The only market for the Minnesota farmer is Philadelphia or New York, and in order to find a market he must sell through commission merchants, and must furnish a high-grade article. The people in Iowa, Minnesota and Wisconsin understand this so well that they have a man go round and teach the people how to make butter, so that they may be able to sell to New York and Philadelphia at high prices. Now, why don't you do that in Pennsylvania? Because you have no competition. Your butter is produced to supply this local market, and it has no standard; but the time has come when, in my judgment, there should be something done in order to make a standard for butter in Pennsylvania.

Now, the labor problem is connected with this matter of farm machinery of which my friend, the Hindoo student, speaks. As an illustration: Not long ago I rode on the train thirty miles in Northern Illinois. I counted the teams that were working on the land, including teams hitched to wagons, and in going that thirty miles I counted twenty-five teams. Six were four-horse teams, two were two-horse teams and the rest were three-horse teams. The two-horse teams were near town, perhaps market gardeners. In other words, three and four horses, weighing fifteen to sixteen hundred pounds each, were doing the work that farmers used to do with two one-thousand-pound horses, in order to meet the labor problem, and that is one of the factors that makes land in Illinois worth a hundred to a hundred and fifty dollars an acre, when land in some parts of Pennsylvania, which raises crops worth more per acre, sell for a good deal less money. The relation of farm labor to the price of farm land in the State of Pennsylvania is an important question, and it may not be out of place to tell you, gentlemen, that there are three questions—four questions—three questions that I have recommended to our Board of Trustees to be brought before the Legislature for an appropriation. One of them is the matter of the quality of butter in the State of Pennsylvania, by putting the question to the factories themselves, and doing something to raise the standard of butter throughout the State; the next question, I think, should be the study of fungus growths as related to the orchardists of Pennsylvania, and the third question should be this question of farm labor, as it affects the relation between the cost of labor and the price of land. Our Board of Trustees went before the Legislature last winter, and asked for about $25,000 a year for the purpose of studying these questions, but the Legislature, for some reason, did not make the appropriation. I think it is only fair to the officers of Pennsylvania State College for you to know why these subjects will not be studied there this year; but if you feel as we do, we shall ask you for your influence when the next Legislature will be asked in two years, for at least as large an appropriation.

Now, there is another question, which is perhaps a rather delicate one, and that is in relation to certain phases of our tax system. I am convinced that certain phases of our tax system need careful study. I do not refer now to the method of raising taxes, but to that which the nation and State demands, and the manner of their distribution; for it is a question whether the taxes raised by the nation and by the State are properly distributed. The taxes of Pennsylvania amount to twenty-five to thirty million of dollars annually, and while they are spending twenty-five or thirty million on State government, they are spending eighty million for national purposes—fifteen for the army, thirty for the navy and so on. The last Legislature appropriated about a quarter of a million, two hundred and fifty thousand dollars, for the purpose of studying agriculture, and the promotion of agricultural experiments, while at the same time we are compelled to contribute to the National Department of Agriculture about a million annually. I am not saying that they give too much to one and too little to the other. I am simply asking the question whether, instead of the Federal Government relying on the states for help, it would not be more natural for the states to turn to the National Government for help.

Now, agriculture may be promoted along three or four lines: First, by making public all matters of public importance; second, by the passage and execution of wise laws, and, third, by a course of knowledge relative to agriculture, and fourth, by a diffusion of knowledge relative to agriculture. This State has, in the wisdom of its Legislature, passed bills of the utmost importance to the farmer of the State, and the State is to be congratulated upon the manner in which these laws have been executed. I know something of the way in which these laws are executed in other states, and I am glad to say something in behalf of the work in this State. In one particular, however, we need legislation, and that is the matter of the parcels post.

The discovery of a new truth is the work of investigation, and requires some work on the part of the investigator. This work has been largely done by the State College of Pennsylvania, and many far-reaching questions have been elucidated. The time has come, however, when the hundred-acre farm in Centre county, and the laboratory of the Experiment Station, can no longer cope with the situation. Our coming Experiment Station will have the same dimensions as the State of Pennsylvania. Let me give you an illustration: There is at Pennsylvania State College the series of fertilizer experiments which has been conducted for twenty-five years. We are this year beginning the twenty-fifth of the series. Now, this information is very valuable to the farmer who has the same type of soil that we have there in Centre county, twelve hundred feet above the sea level; but to the farmer down here in Chester county, three hundred feet above the sea level, with a different type of soil, it will do no good. We must thoroughly study the soil of Pennsylvania, and then we will know where there exists in Pennsylvania the same type of soil as exists on the farm at the Experiment Station, and then we can confidently say to that man, "This is the fertilizer for your use"; but when we come to other soil types, we must first experiment on these soil types before we can proceed intelligently. This is only one of the many instances we can give, and where we can take the work out of the Experiment Station right down to the farmer.

In the diffusion of knowledge there are many agencies, including agricultural publications, Farmers' Institutes and the Agricultural College, but the time has come, in my judgment, when we should take another step. In my opinion, the time has come when we should introduce agriculture into the High Schools. Now, I don't suppose there is any question on the part of anybody as to the desirability of doing so, but the question is, how are you going to do it? There are, I am told, two hundred and sixty-two Township High Schools in the State of Pennsylvania, and I understand the Commissioner of Education says that agriculture must be taught in these schools, but the question is how? How many years would it take at State College to teach those boys and girls to fit them to teach agriculture in the High Schools, and if we got the girls, how many would stay there four years? So you see, the question of adding agriculture to the High Schools is a serious one. Now, then, let us take the summer school, and we take a young man or young woman and give them a year's German in six weeks. They do this every year, taking a young man or young woman, and teaching them six weeks the same thing on which they spend three hours a week for nine months. Now, if it is possible to teach German in six weeks, it is also possible to teach at least the outlines of agriculture in the same time, and courses of study have been prepared to cover what would ordinarily be covered in a year. We cannot expect to turn out a complete agriculturist in six weeks, but we can at least create an interest that will lead to further study, and impart the principles of soil and plant life, which can then be taught in these schools during the next term.

Now, gentlemen, I have outlined briefly what has been done in the first twenty-five years, and in reference to what is next, I would merely suggest to you, as leaders in agriculture, three things, for which, in my judgment, the time has come:

First. The parcels post.

Second. Spreading Experiment Station work to reach every portion of the State, which means a movement for the study of forestry and horticulture, improving the dairy conditions all over the State, and the improvement of the farm and labor condition all over Pennsylvania.

Third. The introduction of agriculture into our High Schools.

Now, gentlemen, these are the first problems, and after we have learned the solution of these, we are ready for what is next.

THE LAWS OF PENNSYLVANIA FOR THE IMPROVEMENT OF LIVESTOCK.

By Dr. Leonard Pearson, *State Veterinarian.*

Mr. Chairman, Ladies and Gentlemen: The laws of Pennsylvania relating to livestock are numerous and voluminous, and, when gathered together would fill about three hundred pages, so, of course, I can't take them in detail.

Most of you know what the State Livestock Sanitary Board and the Board of Agriculture have been doing for the last fifteen years in this direction; but you do not know what the last Legislature did with regard to certain proposals relating to domestic animals in Pennsylvania, and with your permission, without saying anything of old legislation, I will just refer to these new laws.

Of all the great number of laws passed by the last diligent Legislature, there are three that relate to domestic animals. First, the McIntyre bill relating to dogs. Those of you who were at Harrisburg last winter, at the meeting of the State Board, will remember the great interest that was shown there with regard to diminishing the great number of worthless, homeless, ownerless dogs in Pennsylvania. A committee of the State Board of Agriculture was appointed to draft a law. The Secretary of Agriculture was chairman of this committee, and I know that he worked hard for several days, but the bill was defeated by the Legislature as too drastic, and a new bill, a compromise bill, was substituted and signed by the Governor.

All dogs must be registered, so that tax can be paid on them, the amount of tax to be fixed by the County Commissioners, and when the tax is paid the owner is to receive from the Commissioners' office a metal tag, which is to be attached to every dog. The other bill was somewhat more implicit as to the character of the tag, and that sort of thing, and one of the members wanted the dog provided with a license for traveling, and if he traveled at night, to be provided with a red light in front and two red lights behind, and to limit his speed to eight miles an hour.

The dog laws have been violated up to this time. A good many dog laws have been passed, but none of them have been enforced, and if this law has not been enforced it will be on account of lack of public demand and public sentiment in the community in which it is not enforced. It might have been worded a little more specifically, but I think the meaning is clear. The fixing of the amount of the tax is not in this law. This is an amendment of the act approved in 1893, relating to the tax on dogs. The old act of 1893, in reference to that, is still in force. Now, in the sheep-growing district there is a strong sentiment in favor of the enforcement of this law, because any citizen can compel or require its execution. It is very important, indeed, that something of this kind be done, for sheep raising has been steadily declining. Now we have less than a million sheep, where formerly we had a million and a half, and this decline of 50 per cent. is in the face of a rising market for mutton and wool, and an inquiry into the cause of this decline in the sheep business in any community where it is carried on, shows that it is largely due to the sheep-worrying dog. In the southwestern corner of the State, in Greene, Fayette, Washington and Somerset counties, it has declined as coal mining has developed. Little villages have arisen all over these counties, inhabited chiefly by foreigners and dogs, and within ten miles of these villages the sheep industry has been practically exterminated. It is not merely the killing of the sheep that has caused this, for under the old law the sheep owner can claim payment for them out of the dog tax; but it is often the driving and worrying of the sheep that is often more disastrous than if they were killed outright, and, moreover, the small compensation allowed by law when a sheep is killed, is by no means sufficient to cover the loss, and it is very important that something shall be done to reduce the number of worthless dogs in each locality. Under the old law it had to be proven that the dog really killed the sheep before anything could be done, but under this law any dog found worrying sheep, or even in an enclosure where there are sheep, can be killed.

The dog is by far the most noxious animal we have in Pennsylvania, and I say that as a lover and breeder of dogs. A dog allowed to run at large is dangerous, and I believe that the enforcement of this law will do much to prevent the spread of the rabies, which is generally spread by ownerless curs.

Now, another act is to provide for the registration of stallions. This is similar to the Stallion Inspection Law of Michigan, which Governor Hoard says has done more for the improvement of horse breeding in Wisconsin than anything else that has been done within recent years. The states of Minnesota, Utah, and one other state, I think it is Missouri, I am not sure, have also passed similar laws. In Ohio it did not pass the last Legislature, but I think they will bring strong pressure to bear on the next Legislature to have it passed. It provides for the registration of the pedigree of a stallion in the Department of Agriculture at Harrisburg, and a certificate is issued to the owner, which can be used for advertising purposes. If a man has an animal that is not pedigreed, but which he thinks is a good animal, he can have him examined, and secure a certificate to that effect. This makes representation impossible. It also provides for a certificate by the owner, under oath of a veterinarian, that the animal is free from any unsoundness, and any horse not so certified may not be used in Pennsylvania. I understand that there is a movement on foot in Wisconsin to provide for the voluntary official examination of stallions for the purpose of breeding, so as to improve the horse stock in that state still further; so that if a man has a good stallion which he wishes to have approved he can have it done.

There are seven hundred and fifty thousand horses in Pennsylvania—approximately three-quarters of a million. We have 60 per cent. more horses in Pennsylvania than they have in Kentucky, and they are relatively finer, but most of the horses in Kentucky are bred in that state, while most of the horses in Pennsylvania are bred in other states and brought here. That is a distinct difference. I don't know how many horses are brought in from other states annually, but it is between fifty and a hundred thousand, which brings into other states approximately a million dollars annually. Now, this money, which goes to the horse breeders of other states might just as well be kept at home. I think it is true that the average quality of horses in Pennsylvania is not as good as twenty-five or thirty years ago. The argument, I think, is conclusive. The average quality of horses worked is better, while the average quality of horses bred is not so good. I think the enforcement of this stallion law will help to improve matters in this respect.

Then, another important law is Act No. 187, approved by the Governor a few days ago—the Meat Inspection Law. As you all know, President Roosevelt became very much interested in meat inspection last year after the publication of certain revelations as to the conditions of slaughter houses in Chicago. Undoubtedly there was a great deal of untruth, but there was also a great deal of truth in these revelations, and the result was a more stringent Meat Inspection Law, and the appropriation of three million dollars annually for the purpose of this inspection. But this does not reach the establishments engaged in a local business within the confines of the State. This Federal Meat Inspection Law applies only to establishments doing an interstate or export business.

Now, we import from other states only about one-half of our meat supply, so that only one-half of the meat eaten in Pennsylvania is inspected by the Federal Government, and the other half, slaughtered within the confines of the State, is not inspected at all. This made it necessary to supplement the Federal Meat Inspection Law, so this new law came into existence.

The question to us is the probable effect of this law upon the local meat business, and upon the business of cattle-growing in this State. I think there can be no question but that it will be most beneficial, and help to develop our local industry in these respects

As an illustration, I saw a few days ago a strong and rather violent publication in a paper of large circulation in Scranton, calling attention to the fact that since the Federal Meat Inspection Law has gone into effect, about forty-six slaughter houses that were formerly engaged in the interstate trade had changed the character of their business, and were confining themselves entirely to one state, so they could avoid Federal inspection—the inference being that the character of their product was such that if brought under Federal inspection they would be condemned. There could be no other interpretation. This paper insisted that the thing for the people of Pennsylvania to do is to get their meat from other state packers, because we know that when our meat comes from another state it will be inspected and approved by Federal Inspectors.

Now, to do that would be to drive out of business the local beef-raisers of Pennsylvania, and the local slaughter houses which are doing an honest business. Now in order to hold our business, we must give a certificate that the meat is safe, and for that purpose this law was passed; and I certainly hope this law will increase the reputation and the grade of Pennsylvania meats, and create a market for beef cattle, and other meat-producing animals that can be fed in Pennsylvania, and I fully believe that it will do so. It will benefit the consumer, not merely from a sanitary point of view, which is, of itself, of the very highest importance, but also from the economic side; because what would be the effect if our local slaughter houses were to be driven out of business and exterminated? The western packers, having no competiton, would advance prices abnormally, but so long as we get one-half of our meat supply at home, the price can only go so high, the law of supply and demand keeping the price of meat in proportion to the price of live cattle.

I think, Mr. President, that is all that I desire to say at this late hour regarding these three laws. I will be glad to answer any questions, but think the subject will be more fully discussed by Mr. Tower.

HOW FEDERAL MEAT INSPECTION IS CONDUCTED.

DR. E. E. TOWER, *Inspector U. S. Bureau of Animal Industry, Philadelphia, Pa.*

I have been asked to discuss the subject, "How Federal Meat Inspection is Conducted." The time allowed me will not permit of going with detail in all minor conditions, but I will endeavor to give an outline from which you may be able to form an idea of what our present law requires.

First, as to how to obtain Federal inspection:

The proprietor or operator of each slaughtering, packing, meat-curing, rendering or similar establishment engaged in the slaughtering of cattle, sheep, swine or goats, or in the packing, canning or other preparation of any food product into which the meats or meat food products of said animals enter, in whole or in part, for interstate or foreign commerce, shall make application to the Secretary of Agriculture for inspection or for exemption from inspection. The said application shall be made in writing, addressed to the Secretary of Agriculture, Washington, D. C., and shall state the location of the establishment, the address of the owner, or of a duly authorized officer or agent of the same, the kinds of animals slaughtered, the estimated amount of meats or meat food products received from other establishments, and the character, quality and proposed disposition of the products of said establishment. Blank application forms will be furnished by the Chief of the Bureau of Animal Industry, upon request. If an establishment is not in a sanitary condition, inspection shall not be established, and the products cannot enter inter-state or export trade.

Only farmers and retail butchers or dealers supplying their customers may be exempt under the law, but they are, nevertheless, subject to the provisions of the law which places a penalty upon any person who shall sell or offer for sale or transportation for interstate or foreign commerce, any meat or meat food products which are diseased, unsound, unhealthful, unwholesome or otherwise unfit for human consumption. The law applies only to four animals—cattle, sheep, swine and goats—and to the carcasses, meat and meat food products of these animals, and is administered by the Bureau of Animal Industry.

The Secretary of Agriculture is authorized, in his discretion, to cause an ante-mortem inspection to be made of the four above named animals before they shall be allowed to enter into any slaughtering establishment. The law provides that all animals found on such ante-mortem inspection to show symptoms of disease shall be set apart and slaughtered separately from other animals, and when so slaughtered the carcasses shall be subject to a careful ante-mortem examination and inspection. The ante-mortem inspection shall not be made until the animal becomes the property of the establishment or the department has no control over its disposition.

All postmortem examinations and inspections are made by competent veterinary inspectors, graduates of reputable colleges, who, in addition to the college course, have passed a stringent civil service examination.

The number of veterinary inspectors employed by the department under the old Meat Inspection Law was 324. The number of veterinary inspectors of the department on December 1, 1906, was 531. During the month of October, 1906, the veterinary inspectors made postmortem inspection of 4,062,389 animals, and caused the absolute destruction for food purposes, by rendering into non-edible grease, or fertilizer, 2,938 cattle and calves, 832 sheep and 8,328 swine—11,089 in all.

In addition to the carcasses absolutely destroyed for food purposes several thousand other animals were rendered into lard or tallow in order to protect the consumer against any possible danger of infection from eating the meat in a raw or rare state. A conservative estimate of the value, if healthy, of the carcasses and parts destroyed for food purposes by inspectors during the course of one year is more than two and one-half million dollars. In addition to the veterinary inspectors above mentioned, we have another class of men known as meat inspectors. They do not conduct postmortem examinations and inspections, but are men skilled in the preparation and handling of meats. They test meats and meat food products to ascertain whether they are tainted, and to see to it that cleanliness is observed in all branches of the work. They are selected because of their practical experience in these lines, and each one has passed a rigid civil service examination. Also a class of men known as stock examiners, who are principally engaged in the ante-mortem inspection of animals.

REPORT FOR APRIL, 1907.

In the month of April the following appointments were made:

Veterinary inspectors, 31; meat inspectors, 45; taggars, 13; agents for eradication of scabies, 50; for eradication of ticks, 61; reinstated in the above appointments, 25; died, 5; dismissed, 7.

Of the number dismissed, 3 were veterinarians, 12 were meat inspectors, 1 taggar and 1 clerk.

The number of establishments under inspection on December 1, 1906, was 623, and the number has been increased daily. The total number of employes engaged in meat inspection on December 1, 1906, was 1,964. To meet this expense the government carries a permanent appropriation of $3,000,000 per annum.—(Report for April, 1907).

Provision is made in the law for the reinspection of carcasses or parts thereof at such time as may be necessary, and if upon any such reinspection any carcasses, or parts thereof, is found to be unfit for human food, such carcasses or parts thereof shall be destroyed for food purposes by the establishment in the presence of an inspector. The law provides that if any establishment shall fail to destroy for food purposes carcasses or parts condemned by the inspectors, the Secretary may remove the inspector from the establishment. This action would shut out from interstate commerce the products of the establishment.

One of the most important features of the law is the sanitary inspection. The Secretary is directed to cause experts in sanitation and other competent inspector to inspect all establishments in which the four animals are slaughtered, and the meat is prepared for interstate or foreign commerce, and he is authorized to prescribe the rules and regulations of sanitation under which such establishment shall be maintained.

Where the sanitary conditions of any establishment are such that the meat or meat-food products are thereby rendered unfit for human food, he must not allow the meat or meat-food products to be labeled "Inspected and Passed." The sanitary regulations of the department are stringent and vigorously and rigorously enforced.

The law provides that meat-food products which contain dyes, chemicals, preservatives or ingredients, rendering it unsound, unhealthful, unwholesome or otherwise unfit for human food, shall be destroyed for food purposes. The exception to this rule is that preservatives may be used in meat-food products for exportation to any foreign country, where the preservative has been ordered by the foreign purchaser, and when no substance is used in the preparation or packing of the meat, which conflicts with the laws of the foreign country to which it is exported. No preservatives or chemicals other than common salt, sugar, wood smoke, vinegar, pure spices and saltpeter may be used in any meat or meat-food product bearing the legend, "U. S. Inspected and Passed."

The law provides that all carcasses or parts which, upon postmortem, are found to be sound, healthful, wholesome and fit for human food, shall be labeled "Inspected and Passed." This requirement of the law is strictly followed.

All establishments are required to label with the words, "Inspected and Passed." All pots, cans, tins, canvas or other receptacle, or covering of meat-food products prepared under the law, and no meat-food product is allowed to be sold or offered for sale by any person, firm or corporation, in interstate or foreign commerce under any false or deceptive name. The effect of this interpretation is that when one purchases a can of lard bearing the words "pure lard" and the legend "U. S. Inspected and Passed," under the act of June 30, 1906, he may be sure that he is actually receiving more pure lard rendered from the clean, sweet, fat or healthy animals. When a can bearing the legend is marked "Vealloaf," the meat constituent is veal, and not pork. Potted ham is ham, and not minced dried beef.

Inspectors are forbidden to label any carcass, or any part thereof, or meat-food product therefrom, until the same shall have been actually inspected and found to be sound, healthful and wholesome, and fit for human food, to have been prepared under proper sanitary conditions, and to contain no dyes, chemicals or preservatives or ingredients which render such meat or meat-food products unfit for human food. An important feature of the labeling regulations is that each establishment has an official number, and this number must be placed upon each container of meat-food products sent out from that establishment. Thus the establishment which prepared the meat-food product can be identified at any time. It is a violation of law, punishable by imprisonment and a heavy fine, to forge, counterfeit, simulate or falsely represent, or, without proper authority, to use, fail to use or detach, or to knowingly or wrongfully alter, deface or destroy, or fail to deface or destroy any of the certificates, marks, stamps, tags, labels or other identification devices provided for by the law, or by the rules of the Secretary.

A retail butcher or retail dealer is required to submit his plant to sanitary inspection by the department. If the plant proves to be sanitary and the business is of a character that it can properly be called retail, he receives an exemption permit from the Secretary of Agriculture. Two thousand five hundred and fifty permits of this nature have been issued, allowing retail butchers and retail dealers to supply their customers in interstate trade.

When the shipment of a retail butcher or a dealer is offered for interstate transportation, the retailer is required to give a certificate to the carrier that he is a retail butcher or retail dealer, that he is shipping the meat to supply a customer, and that the meat is sound, healthful and wholesome, and fit for human food. These certificates are delivered in duplicate to the carrier, who transmits one copy to the Department of Agriculture, where the amount of description of the shipment are listed against the permit, and thus the department is informed exactly of the character and amount of the shipments made by each retail butcher or retail dealer under permit.

When the farmer desires to ship interstate commerce, he certifies to the carrier that he is a farmer, that the carcasses are those of animals killed by him on his farm, and that the meat is sound, healthful, wholesome and fit for human food.

The farmer does not need a permit from the Department of Agriculture. The forms of certificates are furnished and usually filled in by the agents of the carriers, and all that is required from the shipper is his signature. However, if any person sells, or offers for sale or transportation, any meat or meat-food products which are diseased, unhealthful, unwholesome or otherwise unfit for human food, knowing that such meat or meat-food products are intended for human consumption, he is guilty of a misdemeanor, and is subject to a fine and imprisonment.

Now, let us briefly consider the bearing of the Meat Inspection Law upon the production and handling of meat. The first and most essential thing necessary is to insure the success of the breeders, feeders and packers of this country is as large and as open a market as can be secured for the food animals, and for the meat and meat-food products produced by these. Any measure which will widen the present domestic and foreign markets is a benefit to breeders of live stock, and to the producers of meat. It has been stated with truth that coincident with the passage of the meat-inspection law there was a striking falling off in our exports of meat-food products to foreign countries. This condition was caused by the reports of investigating committees on the condition of the packing houses in the city of Chicago, and of the subsequent publication and agitation of the matter in the newspapers of the United States and of foreign countries.

The Meat Inspection Law and the shrinkage of exports of meat-food products were the immediate results of the conditions found in the Chicago packing houses. It is interesting and instructive to discuss for a moment, showing the value of canned fresh meats exported during the months of July, August, September and October for the past five years. During that period of 1902, the value of canned meats exported was $3,629,508, and the value of fresh meats was $8,485,352. During the same period of 1903 the exports of canned meats amounted to $3,581,220, and the fresh meats to $9,509,362. In 1904 the canned meats amounted to $2,479,848 and the fresh meats to $6,896,063. In 1905 the canned meats amounted to $2,971,648 and the fresh meats to $7,896,063. In 1905 the canned meats amounted to $2,971,648 and the fresh meats to $7,547,199. For 1906 the canned meats amounted to only $1,031,148, and the value of the fresh meats was $7,909,413.

It is, of course, to be borne in mind that during some of these years special causes, such as foreign wars and tariff charges, led to a large increase in our exports of meats; nevertheless, the conclusion is irresistible, from the figures given, that the export trade in canned meats has shrunk temporarily at least 50 per cent. while the average value of exports of fresh meats has been maintained. Practically all the force of the agitation in this country was felt in the sales of unprepared meat-food products, and that the sales of fresh meats have not been materially affected. At no time during the investigation of the packing-house conditions was there any considerable complaint against fresh meats.

The criticism was directed against conditions of filth and uncleanliness in the preparation and handling of prepared meat-food products. Some meat-food products were prepared in a cleanly and sanitary manner, but for the moment the innocent suffered with the guilty. The sole conclusion is, that our own people and foreign nations have discriminated to a nicety between the products which were prepared under proper conditions and the product, the preparation of which was open to criticism.

It should naturally follow, then, when the packing houses of the country are maintained in a sanitary condition, that the Government stamp of inspection upon meat and meat-food products will be given full faith and credit by foreign nations, and in the end we may naturally expect, as a result of the agitation of the past few months and the passage and enforcement of the drastic Meat Inspection Law, that there will be a permanent and steady increase in both foreign and domestic trade.

I am here to say to you that this administration has made, and will continue to make, the Federal stamp upon meat and meat-food products, stand for something. When you see this stamp upon a product, you may know that the meat is from healthy animals,and these animals were killed and the meat was prepared under proper sanitary conditions; that no harmful preservative, chemical, dye or filth has been allowed in the preparation; that the name of the product on the label is a true name, and that the supervision of the preparation of that particular product has been extended from the hoof to the can.

To secure the best results, the breeders and feeders of every state in the Union should take up vigorously the question of the extension of markets, and should back the Department of Agriculture in an insistent demand for an absolutely efficient, vigilant, fair and square meat inspection. We have the healthiest food animals and the best feed in the world. If a due regard be had for cleanliness, decency and honesty in the preparation and marketing of our meat products, the United States will continue to lead the world in live stock and meat.

MEMBERS

OF THE

PENNSYLVANIA STATE BOARD OF AGRICULTURE,

FOR THE YEAR 1908.

Members Ex-Officio.

HON. EDWIN S. STUART, Governor.
HON. HENRY HOUCK, Secretary of Internal Affairs.
DR. N. C. SCHAEFFER, Superintendent of Public Instruction.
DR. EDWIN EARLE SPARKS, President of the State College.
HON. ROBERT K. YOUNG, Auditor General.
HON. N. B. CRITCHFIELD, Secretary of Agriculture.

Appointed by the Governor.

Gen. James A. Beaver, Centre County,	Term expires 1910
R. I. Young, Middletown, Dauphin County,	Term expires 1911
R. H. Thomas, Jr., Mechanicsburg, Cumberland County,	Term expires 1912

Appointed by the State Poultry Association.

J. D. Nevius,	Philadelphia,	1910

Elected by County Agricultural Societies.

			Term expires.
Adams,	A. I. Weidner,	Arendtsville,	1909
Allegheny,	J. S. Burns,	Imperial, R. F. D. No. 1,	1909
Armstrong,	S. S. Blyholder,	Neale,	1911
Beaver,	A. L. McKibben,	New Sheffield,	1911
Bedford,	W. C. Lutz,	Bedford,	1909
Berks,	H. G. McGowan,	Geiger's Mills,	1910
Blair,	Howard Cox,	Bellwood,	1911
Bradford,	Edwin Platt,	Wysox,	1910
Bucks,			
Butler,	N. F. Bartley,	Euclid R. F. D. 46,	1911
Cambria,	H. M. Gooderham,	Patton, R. F. D.,	1910
Cameron,			
Carbon,			
Centre,	John A. Woodward,	Howard,	1909
Chester,	M. E. Conard,	Westgrove,	1909
Clarion,	S. X. McClellan,	Knox,	1910
Clearfield,	E. M. Davis,	Grampian,	1910
Clinton,	J. A. Herr,	Millhall, R. F. D.,	1911
Columbia,	A. P. Young,	Millville,	1909

			Term expires.
Crawford,	J. F. Seavy,	Saegerstown,	1911
Cumberland,	Chas. H. Mullin,	Mt. Holly Springs,	1909
Dauphin,			
Delaware,	R. M. Heyburn,	Ward,	1911
Elk,	John M. Witman,	St. Mary's,	1911
Erie,			
Fayette,			
Forest,			
Franklin,	John P. Young,	Marion,	1911
Fulton,	J. L. Patterson,	McConnellsburg,	1910
Greene,	N. M. Biddle,	Carmichaels,	1910
Huntingdon,	Geo. G. Hutchison,	Warrior's Mark,	1909
Indiana,	S. M. McHenry,	Indiana,	1910
Jefferson,	Peter B. Cowan,	Brookville,	1910
Juniata,	Matthew Rodgers,	Mexico,	1909
Lackawanna,	Horace Seamans,	Factoryville,	1910
Lancaster,			
Lawrence,	Sam'l McCreary,	Volant,	1909
Lebanon,	H. C. Snavely,	Cleona,	1910
Lehigh,	P. S. Fenstermaker,	Allentown,	1909
Luzerne,			
Lycoming,	A. J. Kahler,	Hughesville,	1909
McKean,			
Mercer,	W. C. Black,	Mercer,	1911
Mifflin,	M. M. Naginey,	Milroy,	1910
Monroe,	R. F. Schwarz,	Analomink,	1911
Montgomery,	J. Sexton,	North Wales,	1911
Montour,			
Northampton,	W. F. Beck,	Easton, R. F. D.,	1909
Northumberland,	I. A. Eschbach,	Milton, R. F. D.,	1911
Perry,	A. T. Holman,	Millerstown,	1910
Philadelphia,	Edwin Lonsdale,	Girard College, Phila.,	1910
Pike,			
Potter,	H. H. Hall,	Ellisburg,	1909
Schuylkill,	W. H. Stout,	Pinegrove,	1910
Snyder,	J. F. Boyer,	Freeburg,	1909
Somerset,	John C. Weller,	Rockwood R. F. D. No. 2,	1911
Sullivan,	E. R. Warburton,	Dushore, R. F. D., No. 3,	1909
Susquehanna,	Frank A. Davies,	Montrose,	1910
Tioga,	E. B. Dorsett,	Mansfield,	1911
Union,	J. Newton Glover,	Vicksburg,	1911
Venango,			
Warren,	R. J. Weld,	Sugargrove,	1911
Washington,	D. S. Taylor,	Burgettstown,	1911
Wayne,	Warren E. Perham,	Niagara,	1910
Westmoreland,	M. P. Shoemaker,	Greensburg,	1910
Wyoming,	D. A. Knuppenburg,	Lake Carey,	1910
York,	G. F. Barnes,	Rossville,	1911

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PRESIDENT.

Hon. Edwin S. Stuart, Governor,	Harrisburg.

VICE PRESIDENTS.

R. F. Schwarz,	Analomink.
G. G. Hutchison,	Warrior's Mark.
S. S. Blyholder,	Neale.

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J. Newton Glover, Chairman,	Vicksburg.
H. C. Snavely,	Cleona.
A. J. Kahler,	Hughesville.
A. T. Holman,	Millerstown.
W. H. Stout,	Pinegrove.
Matthew Rodgers,	Mexico.
M. M. Naginey,	Milroy.
H. G. McGowan,	Geiger's Mills.
N. B. Critchfield, *Secretary*,	Harrisburg.

ADVISORY COMMITTEE.

N. B. Critchfield, *Secretary*,	Harrisburg.
Matthew Rodgers,	Mexico.
H. C. Snavely,	Cleona.
M. M. Naginey,	Milroy.

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Botanist,	Prof. W. A. Buckhout,	State College.
Pomologist,	Dr. J. H. Funk,	Boyertown.
Chemist,	Dr. William Frear,	State College.
Vet. Surgeon,	Dr. Leonard Pearson,	Philadelphia.
Sanitarian,	Dr. Geo. G. Groff,	Lewisburg.
Microscopists and Hygienists,	Prof. C. B. Cochran,	West Chester.
	Dr. Harvey B. Bashore,	West Fairview.
Entomologists,	Prof. H. A. Surface,	Harrisburg.
	Prof. Franklin Menges,	York.
Ornithologist,	Prof. H. A. Surface,	Harrisburg.
Meteorologists,	Prof. W. G. Owens,	Lewisburg.
	Silas R. Eshleman,	Harrisburg.
Mineralogist,	Baird Habberstadt,	Pottsville.
Apiarist,	H. C. Klinger,	Liverpool.
Geologists,	Dr. Isaac A. Harvey,	Lock Haven.
	W. H. Stout,	Pinegrove.
Forests and Forestry,	Robert Conklin,	Harrisburg.

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LEGISLATION.

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Hon. Jason Sexton,	North Wales.
Hon. H. G. McGowan,	Geiger's Mills.
Matthew Rodgers,	Mexico.
S. S. Blyholder,	Neale.

CEREALS AND CEREAL CROPS.

J. Newton Glover, Chairman,	Vicksburg.

ROADS AND ROAD LAWS.

Samuel McCreary, Chairman,	Volant.

FRUIT AND FRUIT CULTURE.

H. H. Hall, Chairman,	Ellisburg.

DAIRY AND DAIRY PRODUCTS.

W. E. Perham, Chairman,	Niagara.

FERTILIZERS.

Jason Sexton, Chairman,	North Wales.

WOOL AND TEXTILE FIBRES.

W. C. Black, Chairman,	Mercer.

LIVE STOCK.

I. A. Eschbach, Chairman,	Milton.

POULTRY.

J. D. Nevius, Chairman,	Philadelphia.

FLORICULTURE.

Edwin Lonsdale, Chairman,	Girard College, Phila.

FEEDING STUFFS.

G. G. Hutchison, Chairman,	Warrior's Mark.

PAPERS READ AND ADDRESSES DELIVERED AT THE THIRTY-FIRST ANNUAL MEETING OF THE PENNSYLVANIA STATE BOARD OF AGRICULTURE, HELD AT HARRISBURG, PA., JANUARY 22 AND 23, 1908.

REPORT OF THE COMMITTEE ON APIARY.

BY J. W. NELSON, *Chairman.*

The season of 1907 has been an unusual one, and probably no branch of industry is more vitally affected by climatic conditions than that of Bee Husbandry. Owing to a mild winter, there was very little actual winter loss, but a very warm week in March was followed by cold and wet weather, lasting almost continuously till the first week in June, causing very heavy losses almost all over the country. Thousands of colonies died and thousands more were so reduced as to be of no use the present season. Practically all of this loss could have been avoided by careful feeding, but too much other work and the hope that the weather might change sooner than it did, led many to wait until it was too late. In my own case fully one-half of my colonies did not produce a swarm or produce a pound of honey and have scarcely enough stores to winter them, while some that had honey to carry them through the unfavorable spring turned off two swarms and from twenty-five to fifty lbs. of surplus. The one that I reported as having Foul Brood last year turned off a swarm and forty-five lbs. surplus with no sign of disease. This with like reports coming from all over the country has led me to doubt the wisdom of Special Legislation on this line. A weak effort has been made at the last two sessions of the Legislature to get a Foul Brood law passed. In both cases the result was a failure. The last bill offered, while containing some good features, was open to the objection that it took the subject entirely out of the hands of the Department of Agriculture.

There are some very good reasons why this should not be the case. Apiculture is a part of agriculture and should be a part of its work, besides I am of the opinion that without a large expenditure of money the work would be a failure. I am of the opinion though that the same amount of money expended in educating the farmer in the cause and control of bee disease would bring better results. I think that we have the disease under control and that it is not only necessary to kill either the bees or queen or even to destroy hives or comb, but there ought to be some one in each corps of lecturers fully competent to give this instruction.

There are three essentials to success. First, to remove the old bees and queen to a new hive entirely without comb, when they have consumed all the honey they contained, or say the second day put them on comb foundation. Next take the hive containing the brood to a new location, keep almost closed till brood is all hatched. Destroy all queen cells and keep queenless at least twenty days, then give them a queen cell just capped, by the time this queen emerges from her cell all old honey will have been consumed and the bees will have the cells all cleaned out. Third—carefulness. If these simple instructions are carefully carried out, all will be well, but it must be remembered that no flying bees from the diseased hive be allowed to enter any other hive as they will carry the disease. To do this it must be done after the bees quit flying for the day, and it would be well to cover with a cloth the hives nearest the diseased one. It will also be necessary to close the entrance of the hive containing the diseased brood one day and then to watch closely that no robbers get in. If the young bees get short of stores they must be fed, and if the larvæ are 40 per cent. or more diseased, it will not pay to bother with them, in this case the combs and brood should all be burned. The unfavorable weather of April and May was about as disastrous to the fruit as to the bees, most of the Japan Plums and peach trees dying to the ground. There was a light run of honey in June, a fairly good basswood flow. Buckwheat was not worked on but a few days, but we had a good flow for two weeks on the goldenrod and astors, colonies that were strong making a good surplus. Reports vary. Some sections report a fairly good yield while others report failure. On the whole the crop is about 80 per cent. both in Pennsylvania and most of the United States. The Department of Agriculture is not doing as much as it should for the industry. There is too much money going out of the State for honey, too little of it consumed, while too many thousand dollars worth goes to waste ungathered. So that there is a large field open for development. While it is all right to encourage the farmer to produce more honey, it is a question whether he can make it a success, or whether we are not approaching in agriculture as in mechanics, an age of Specialized Industry.

REPORT OF COMMITTEE ON DAIRY AND DAIRY PRODUCTS.

BY R. J. WELD, *Chairman.*

The year 1907 has been a remarkable one for high prices. Dairy products have not been the exception. The year entered with butter at 32 cents and the market did not fall below 22 at any time during the year, going back up to 30 cents at the close of the year. The demand for dairy products has been brisk throughout the year and the man who was in a position to supply found a ready market at good prices. The gross returns from the dairies have been larger during the past year than for several years previous but this is off-set by the high prices of feeding stuffs so that the net return has not been as much in excess of previous years as some might expect although several reports have come to me which indicate that the dairies are returning to their owners rather above the average. This is the encouraging feature of the business and to my mind shows that some of the dairy work which is being done throughout the state by interested men and the agricultural press is having its effect. The greatest need of the present day dairymen, as I see the situation, is a more thorough knowledge of his business. He needs to place every animal in his herd upon her own merits by carefully weighing her milk at each milking and testing it once a month and then eliminating those animals which do not give a profitable amount. The matter of improved blood in the sires of the herds is also an important one and too little attention is given to this important item in dairy work.

Another matter that is worthy of consideration at the present time owing to the very high price of all feeding stuffs is the net returns from the cows for the care and feed given them. It seems to me that the demand for good dairy stock this spring will be brisk, and it is interesting to note that those animals which show capacity find the most ready sale. This only further emphasizes the importance of more care in the breeding of our dairy stock. It seems to me that every member of this organization could do a lasting good for the people of his community if he could in some way incite them to a more careful consideration of their breeding stock.

REPORT OF THE COMMITTEE ON FEEDING STUFFS.

By G. G. Hutchison, *Chairman.*

One year ago your Board created a new Committee, naming it the Feeding Stuffs Committee, and appointed me as Chairman. I would say the term "feeding stuffs" covers a multitude of sins in the feeds that come into and are manufactured in Pennsylvania. Our forefathers manufactured their chops out of whole grains, such as corn, rye, oats and other grains grown on the farm. You, as boys, remember going to mill, as it was called in our day. You can remember the old horse that you rode, carrying you on top of a bag of grain. The only one the farmer had to watch at that time was the good miller. He was supposed to take out one-tenth for his share for grinding the feed, but how often we thought he had given us his share and kept the grist. As years come and go, men have to have drink and food taken from the cereals and left this a by-product. The brewer leaves the barley and corn, which are dried and sold as brewers' grains. The oat mills which manufacture our oat meal, leave the oat hulls. The manufacture of hominy and breakfast foods, leave the hulls and germ. The distillers leave distillers' grains. The glucose factories leave gluten meal, and so we find these goods coming into the markets of Pennsylvania under the names of different articles of commercial feeding stuffs compounded as it may suit the manufacturer.

On April 25th, 1901, Governor Stone approved a law that had been passed by the Legislature, known as the law regulating the sale of concentrated commercial feeding stuffs. This law was amended on April 24th, 1905. The Department of Agriculture enforced these laws. For several years the agents of the Secretary of Agriculture visited the dealers and secured samples of the different feeding stuffs that were on the markets, as the law directed, and gave copies of the law to the dealers, trying by this means to have the dealers and manufacturers comply with the law, but this did not do any good. The manufacturers kept on making poor low grade feeds and flooding our markets with the same. On December 4, 1905, your Secretary of Agriculture, Hon. N. B. Critchfield, gave orders to bring suits on each sample where the dealers had violated the law. This was done and the Department was successful in securing convictions in almost every case. In some counties prominent attorneys were employed and cases were fought with a good deal of opposition, but the courts and juries sustained the law and, with a few exceptions, verdicts in favor of the Department were given.

This work showed the manufacturers outside of Pennsylvania that the Department of Agriculture meant to enforce the law as they found it on the statute books. But you may ask, What were the violations? If you will secure Bulletin No. 145 of the Department of Agriculture in regard to concentrated feeds, it will give you the analysis and will show you the adulterations. I might say that the chemists found in wheat bran, rice hulls, corn cobs and other adulterants. In samples of chop were found coffee hulls and a number of other adulterants; but the great adulterant coming into our markets at that time, was oat hulls. They were coming in by the carload and almost every dairy county had large feed stores handling oat hulls. Not being satisfied to sell the oat hulls that came from the oat grain, there was another feed that they combined with it, known as oat dust, also the sweepings of the large mills. This feed was sold in competition to oat chop, and you can readily see what amount of deception there would be in this feed.

In the trial of these cases, I frequently ask the question, What is the feed value of a ton of oat hulls and oat dust? The answer Prof. Fuller, our Chemist, gave, was $5.00 per ton, but at this value to-day and what it shows in the market, it would be $3.55 per ton. This stock was retailing at $18 to $20 per ton according to the price of oats chop. They would always sell it a few dollars less, and place the analysis high in protein and fat. On this is what is based our prosecution, as false analysis of protein and fat. Very few of the oat hulls and oat feed people made a defense, as they had nothing to stand on and they paid their fines without a contest.

Another way of adulteration, men who are millers and feed dealers, would buy a carload of these oat hulls and oat dust and mix it with a small percentage of ground corn or glutten meal and sell it for corn and oats chop.

We have broken up this custom, and in our work do not find our millers or feed dealers following out this practice. I would say that the millers of Pennsylvania are making their chop of whole grain except in some cases where they use wheat midlings or wheat bran. This was the condition of affairs, as we found them in Pennsylvania when the Legislature met last year. A number of feed bills were started in the Legislature, but after they had been in for some time a conference was called by the Agricultural Committee of the House, of the millers, feed dealers, farmers and all that were interested in this legislation, and after giving the matter a great deal of study, the bill that is now on the statute books, which became a law on May 28th, 1907, is the one that we are working under. All parties who were interested in the framing of this law were working for the best interests of the farmers and feed dealers.

The bill made a number of changes. I might mention in regard to sampling, the law states that the sample must be taken from four separate packages and thoroughly mixed and one sample left with the dealer and the others sent to the Secretary of Agriculture. It also provides that there is a variation in the analysis, so as to meet the climatic conditions that may exist in the growing of grains. It also provides that any citizen of the Commonwealth can send a sample to have analyzed by sending a fee of $1.00. I would state, under this provision, that 293 samples have been received and analyzed since August 1, 1907, when the new law went into effect. The new law provides that the crude fiber must be given on the analysis and the composition or ingredients from which the feed is compounded. This is a very important provision. The farmer may not understand the full meaning of protein or fat, as he sees it on the package, but when he reads that it contains weed seeds, rice hulls, peanut hulls and substances that he knows do not contain any feed value, he will soon say to his dealer, I do not wish to buy food of that kind, and by this means we will be able to correct an imposition that is being imposed on the Pennsylvania farmers and stock feeders.

Another section of the law regulates the manufacture and sale of patented or trade marked poultry foods. This involves such preparations as stock foods, poultry foods, and names that indicate that they are a food, or feed or poultry food for domestic animals. A number of the farmers are claiming that their goods are only for medicinal purposes, and are removing from their labels anything that may designate them, as a feed or food. There is a great fraud in the composition of these preparations. The base of a number of them is wheat middlings, and the analysis shows that the other ingredients contained therein can be bought in any drug store at a small cost. Almost any of these preparations can be manufactured at a cost not exceeding thirty dollars per ton, and they sell from 90 to 400 dollars per ton, as we find them on the markets. A number of our poultrymen claim that they derive no benefit at all from feeding these foods, but almost every country grocery store carries a large stock of them, and if the chemist and poultrymen are correct, I am afraid there are thousands of dollars paid out each year in Pennsylvania for these preparations, that if they were invested in oyster shells, grit, corn, oats, bran and wheat middlings, would help the American hen to produce a larger number of eggs and bring more dollars and cents to those who keep poultry.

In the enforcement of the law, the imprisonment clause was stricken out, but the amount of fine for the second offence was increased. Also in the matter of fines and analysis fees, these are all paid to the State Treasurer. None of these go to the Department for the enforcement of the law. This, in my opinion was one of the best provisions that could have been placed in the law, as it took out of the law the sting that the Department and its representatives were receiving money from the attorney and others who were opposing the enforcement of the law. The Legislature, in its wisdom, provided an appropriation to cover the expenses for the enforcement of the law. The new law has increased the work. The Laboratory now has one Chief Chemist and three Assistant Chemists, with one Laboratory Assistant. In the office we have a Stenographer, in the field work, there are three agents. We have plenty of work for all to do. In fact the laboratory is now crowded with work.

I might refer to what we are finding in the markets at the present time. We find that the man who compounds molasses grains has found a mode of covering up a large amount of adulterations. He takes as a base, distillers' grains or brewers' grains, and with this he mixes rice hulls, peanut hulls, barley hulls, weed seeds and screenings. The screenings here referred to are not wheat grains, but they are weed seeds and other impurities that are screened out of the wheat, oats and other grains that are purified for other purposes. We are having quite a warfare against these dealers at the present time. We find on the market a meal known as peanut hull. This is being sold to some extent, and is found in some of the by-product feeds. We also find a number of gluten feed manufacturers that are artificially coloring their gluten feed. The question of placing weed seeds in as an adulterant, is a very serious one to the farmers of Pennsylvania. These weed seeds are not digestible and they pass through the animal whole and are distributed over our farms, and in a short time there is a new crop of weeds springing up over the fertile farms of Pennsylvania, and our farmers are at a loss to know where they come from. In this line, I would make a suggestion to the Board, that they favor the law regulating the sale of grass seeds in our State and have some standard of purity.

The new law went into effect on August Ist, 1907. Prior to that time, there were sent out 15,000 copies of the new law. These were sent to as many of the feed dealers and millers in Pennsylvania as it was possible to secure their addresses. Copies were also sent to all of the manufacturers of feed products outside of the State. Care was taken in sending these copies out, as each one was sent in a sealed envelope. Copies were sent to the weekly and a number of the daily papers throughout Pennsylvania. This Department did this that the dealers might become versed in the new law, and not be ignorant of its provisions. The laboratory in which this work is being done is situated on the fifth floor of the north wing of the new Capitol building, Harrisburg. If any of you wish to visit this place and see the work there, Prof. Fuller, who is the Chief Chemist in charge of the work, or any of his assistants would be glad to show you what we are doing. I have here before you some samples of the different adulterants, as the Chemist is finding them. I would be pleased to have you examine them.

This Division is being conducted for your benefit. I would ask you to make use of the same. If you would for a few minutes just turn your thoughts to the money value that this work is accomplishing for the farmer, it would astonish you. Take for instance, a car load of twenty tons of feed. This car costs the farmer $22.00 a ton. That would be $444 he pays for it on sight draft. Now suppose this car is made up of one-fifth adulterant, you have the sum of $88; but a large percentage of this feed is adulterated from one-fourth which would run it over $100. Then if you take into account this low grade feed which is not digestible, you are still adding to the loss side of this claim. But I do not wish to make this my first report too lengthy. This is a subject to which we are giving our best efforts to try and save the farmers of this State from buying this worthless feed.

We are often asked the question, Has not one of the Courts of Philadelphia declared the commercial feeding stuff law unconstitutional? I would state for the information of the Board that they have not declared this law that we are working under now unconstitutional, but Judge Audenried declared the amendment to the law of April 25th, 1901 unconstitutional as far as it regards bran and middlings. He declared the proviso which is as follows: "Providing that nothing in this act shall be construed with prohibitng persons engaged within the State of Pennsylvania in the business of manufacturing flours, from selling at the place where made their own manufacture of bran and middlings." The Department of Agriculture did not take this matter to a higher court, as the Legislature was considering the present law and that portion of the new law was changed and was worded as to not raise that question. In the trial of the cases under the new law up to this time, the attorneys for the defense in the cases that we have brought have not questioned the constitutionality of the law. We cannot tell what they will do, but if I am rightly informed, a section of the law can be declared unconstitutional and not effect the general law.

REPORT OF THE COMMITTEE ON FLORICULTURE.

By Edwin Lonsdale, *Chairman.*

Your Committee beg leave to report that the demand for flowering and decorative plants and cut flowers is on the increase. For the season covering the latter part of the year 1906 and the first half of the year 1907, it was the very best in the history of commercial floriculture, both for the volume of business done, and the remunerative price obtained. This statement applies all along the different lines—with those who issue catalogues and fill orders through that medium, and from which small orders are delivered through the United States mails and the larger ones through the different express companies. It is amazing, the number of plants that are carried to the furthermost ends of this and other countries through the mails, and there would be far more plants carried by this method if heavier packages than is now lawful were allowed by Act of Congress to be transmitted in that way.

The city florists never did a more profitable business than was done during the period referred to, and the growers of cut flowers who make a specialty of that industry never added so much to the area for the growing of flowers in any one year than was done last summer, and the superstructure on which the glass is laid was never so nearly solid as at the present time; the very best materials obtainable are used, and as much iron and steel as it is practicable to be put into such buildings are made use of. Cement, now-a-days, is in great favor both for the walls on the outside and the tables or retaining walls on the inside, all of which are healthy signs of the confidence of those who are directly interested in the still greater developments that are hoped for and expected in the future for floriculture. The backward spring of 1907 interfered somewhat with the demand for plants used for outdoor decorations. This applies to what are known as tender or bedding plants such as Geraniums, botanically known as Zonale Pelargoniums, Verbenas, Coleus, Crotons, Cannas and similar plants that need indoor protection in the winter time; but though the season was later than usual, there was little or no surplus stock left over. The demand for the hardy herbaceous plants continues to increase; these live out all winter, and in favorable locations increase in size and general effectiveness yearly. This class includes Peonies, Phlox, Columbines, Irises, and so forth.

All classes of roses are constantly increasing in demand. The Rambler varieties are increasing in number, of which the Crimson Rambler was the first to attract universal attention. Westgrove, Chester County, this State, is noted for the number and quality of rose plants sent out from there, and these go to all parts of the world. There are over one thousand varieties grown there, and it is further claimed that over one million plants of the rose are grown and sold annually from this great centre of the rose growing industry. The raising of new varieties of the rose from seed still goes merrily on. At the last meeting of the Florists' Club of Philadelphia, held two weeks ago, there were some very promising new varieties on exhibition. Among them was "Aurora," a Pennsylvania seedling, raised at Leighton, and is the result of a cross between two French roses, namely, Souviner du President Carnot and Bon Silene. Unfortunately, there already is a variety called Aurora, so in order to avoid confusion, the matter should be referred to the nomenclature committee of the Society of American Florists, with the object in view of changing the name. I would suggest the name "Bon-Carnot" be substituted. This would solve the problem and be a combination of the parents of the rose. The claim is made for those who have watched the development of this new rose that it is an improvement on a variety that is at the present time quite a favorite, namely, "Madame Abel Chatenay." Aurora, as we will still call it until its name is changed, is well bred. One of its parents—the Bon Silene—was a great favorite from twenty to thirty years ago, and is still grown to some extent and used when "society buds" make their debut, and it is also used for sentimental reasons among those who were the reigning belles in society a quarter of a century ago. Its other parent—President Carnot—is a beautiful, delicate flesh pink in color, and the shape of the buds are all that could be wished. The Aurora is being tested by our expert in growing roses for cut flowers at Hillside, Montgomery County, and great hopes as to its future value are confidently indulged in.

"Wyndmoor" is another Pennsylvania seedling, as it is a native of Montgomery County, and was raised from seed in a rose-growing locality by the name which the new rose is known by, namely Wyndmoor. This rose growing settlement is about twelve miles from the City Hall, Philadelphia, and one half mile over the dividing line between Montgomery and Philadelphia Counties. There are now seven separate establishments located here, where in the year 1880, one only was started in a very modest and unpretentious way. It takes about five thousand tons of coal every winter to heat the numerous greenhouses here. The new rose now under consideration is a seedling between the well known and celebrated "American Beauty" and "Safrano," another old-time favorite, which flourished at the same time with the Bon Silene, above referred to. Wyndmoor is also pink in color, resembling in that respect the Hybrid Remontant, "Mrs. John Laing," though the flower of the new rose is not quite so large as the older variety, but it has the advantage of being a perpetual bloomer. It is very well thought of by those who admire and use flowers in large quantities. At one of the swell balls held a week or two ago in Philadelphia, buds and open blossoms of this variety were used to the number of seventeen hundred, and gave entire satisfaction. So far this new variety has only been used for winter flowering.

Still another seedling rose raised in Pennsylvania that promises to make good, and which first saw and flourished in the bright sunlight in the good city of Philadelphia has been honored by the name of the Superintendent of the United States Botanic Gardens at Washington, D. C., namely William R. Smith. This is the result of a cross between Maman Cochet and Madame Hosbe. The latter, which I believe was the pollen parent, was grown quite largely for the production of cut blooms in winter, and is grown to some extent at the present time, as it is a free bloomer and possesses the ideal shape in the bud form, and by liberal treatment the flowers may be grown to quite a large size, but its coloring was not considered sufficiently decided to become popular as a commercial cut flower; it is a creamy white; had it been a bright yellow similar to the Marechal Neil or Pere des Jardins, it would be grown quite extensively to-day. While the seed or pistilate parent, Maman Cochet, is recognized for growing outdoors as the Queen of pink garden roses, and where the tea scented roses are hardy, this variety is found to be the hardiest of the hardy. The progeny of this good pair of roses, the William R. Smith, was discarded by its raiser for winter blooming as not being bright enough in coloring during the dull winter months, but a firm of florists in the State of Indiana claim to be very much encouraged with some experiments they are making with it and are hopeful that they will succeed in developing it into a valuable winter bloomer. It has already proven its worth as a garden rose. Should it prove to be valuable for winter forcing, it will be another lesson taught, which is: not to be too hasty in condemnation, for it is a well-known fact that at the present time the very popular Irish rose, Killarney, when it first came out was by more than one firm of rose growers in the vicinity of Philadelphia, put aside as being too flimsy in its petalage. It is now very largely grown, being a very beautiful shade of delicate pink in color, and the buds are exquisitely graceful in form. This brings us to another new Irish rose, Mrs.

Jardine. It was raised in Ireland, but its good qualities are being developed by a rose growing expert at Sharon Hill, Delaware County. It is being very highly spoken of as a promising variety. It is pink in color, but quite distinct from all others with pink flowers, being of a very delicate tone of color, and when the flower is about half open it is very beautiful.

Two other new roses were on exhibition at the Florists Club meeting above referred to, one of which came from Chicago, and the other from Richmond, Indiana. That coming from Chicago is known as the Mrs. Potter Palmer, and is what is known as a "bud variation," which means that it produces flowers different in color from the plant from which the cuttings or slips were taken; for instance, sometimes a branch on a given rose bush or some other plant may produce flowers differing in color from the other part of the plant; said branch is cut away and slips made therefrom. The young plants resulting from the cuttings are carefully watched to see if they produce the same color as the branch did from which the cuttings were made, and the chances are in their favor that they will, but sometimes they will take upon themselves to revert to the same color of flower that the original plant produced. Then, of course, our efforts have been in vain and have gone for naught. This particular variety, Mrs. Potter Palmer, produces flowers of a darker colored shade of pink than does the plant Madame Abel Chatenay, from which the newer form sprang. Whether it will prove valuable remains to be seen after further trial. The variety which came from Richmond, Indiana, is claimed by the originator to be a rival of the ever popular American Beauty, and a further claim is made that it is very much easier to manage than is the old standby, American Beauty, being what is known as an "easy-doer" but whether it is so or not on all soils and in all situations can only be proven by experimenting.

While it is quite correct to go on experimenting, with the hope and desire of producing improved varieties, all wise growers try all new varieties, but still hold on to that which is good, and that accounts for the fact that there are more American Beauties being grown for cut flowers in America to-day than there ever were before.

I have dwelt somewhat at length on the new rose question, because it is novelties in the way of new forms, new or brighter colors, or larger flowers which act as an incentive to higher ideals among the patrons of Floriculture and those who are interested in the same. It is the hope of producing something superior to what is already in existence that springs eternal in the flower growers breast.

Farms are being bought on which to erect greenhouses for the purpose of growing therein the already tried and true varieties of the rose. About a year ago fifty acres were bought in Montgomery County by a firm of rose growers, and which is located quite close to the Reading Station at North Wales, and is in accordance with advice given in Bulletin No. 97, published in 1902 by the Department of Agriculture. This rose house is said to be the largest greenhouse in the world. It is over 150 feet wide, and will average between 400 and 500 feet long. For some reason only known to the owners, one side of this mammoth greenhouse is longer than the other, giving the end towards the Northeast the diagonal form, but for what reason is only known to the proprietors. This rose house is devoted exclusively to the growing of one variety, and that is the American Beauty, and in it there are 45,000 plants, and the purpose for which they are grown is for cut flowers. Montgomery County, I believe, produces more of the rose, American Beauty, for cut flowers than any other county in Pennsylvania. At the last census, taken in 1900, there was nearly $9,000,000 invested in the business of Floriculture. Only one state in the United States exceeds that amount, and that is the State of New York.

The past summer for carnations was not the best in some districts for producing large plants, many dying outright, consequently the supply of cut carnations flowers last autumn was not so good as in some former years, and prices ruled firm in consequence. Some growers of carnations when preparing them for blooming in winter, prefer to grow their plants in pots, from the time the cuttings are rooted and taken from their propagating beds, until planted inside the greenhouses especially prepared for the plants to bloom in during winter season, whereas others grow them outdoors all summer, and treat them similar to any other growing crop, as vegetables, by hoeing to destroy weeds and to keep the soil loose and in proper condition to conserve moisture and allow them to remain until just before frost may be expected, when they are transplanted to their winter quarters. And again other growers give them what might be termed the intermediate method, which means that the young carnations are planted in the field or garden just as soon as severe frost is over, and allow them to remain there until the first week in July—some florists and gardeners prefer the month of August to transplant them in to their winter quarters; there are really no hard and fast lines that are strictly adhered to in respect to the time when plants are transferred from the garden to the greenhouses, but it is quite noticeable that each year we find new con verts to the early lifting from outside to inside and I would not be at all surprised to find in a few years from now, that the indoor treatment will be adopted altogether all over the country. Time will not permit of me going any more elaborately into carnation growing, but I thought it best to make some allusion here to the different methods of carnation culture to show that this branch of Floriculture has not been sufficiently systematized and reduced to a science, as has been done in the cultivation of roses. One reason is that carnations are not so exacting in their requirements as is the rose. They do not require so much heat as roses do, and will do fairly well no matter which of the different treatments are given to them. A night temperature of 50 degrees is high enough for the generality of carnations, but roses need 10 degrees higher at night—say 60 degrees. Before leaving the subject of carnations, I will say that new and greatly improved varieties are being produced and the end is not yet. More rapid progress is being made, I believe, along the lines of improving the varieties of carnations than there is in the roses. The varieties of carnations that were at the heighth of their popularity twenty-five years ago, have been discarded and are almost forgotten, whereas some of the most satisfactory roses that are grown now, were, also grown twenty to twenty-five years ago—American Beauty, for instance.

In conclusion, the financial troubles that struck this and some other countries last fall, have been felt among flower sellers generally, but not so much as might be supposed, considering that flowers are generally thought to be a luxury. Flowers are in these days believed by many people to be among the necessities, as they are and may be used appropriately on all occasions, whether at births, marriages and at deaths; they are never out of place no matter when or where they may be used.

ADDRESS OF GENERAL BEAVER.

Mr. Chairman, I am gratified by the honor you have just done me in calling on me at this time. From what my friend Herr, says, it might be inferred that I am loaded at the wrong end. I did not expect to say anything on agriculture this morning, and my thoughts are in such shape that I am afraid they will hardly be helpful to any one of you.

To be a successful farmer a man must necessarily know other things, and must keep in touch with the progress that is made. One thing I think in which more progress has been made this year than in any other line of agriculture, is in the matter of soil analysis, and I have been strongly impressed by the importance of this subject. How and where and why to place things so as to get the best results is of the greatest importance to the farmer. Up at State College we recently purchased a farm, not quite adjoining our property, but one with many desirable features, with the object in view of converting it into an orchard. The orchardist came and analyzed the soil. There was an open, well-turned piece of ground, that it occurred to me was just the thing, but he did not agree with me. We went up and down that ground, and he said "here a Baldwin apple will grow," and again "here they won't grow." This soil expert found there were twenty different areas. The elements of the soil contribute largely to the life of the tree and its fruit, and he found these elements varied, so he could tell where the fruit would grow and where it would not. I don't know whether he is right or not. Time will tell; but the soil expert was very positive, and willing to stake his reputation upon it. This was the first time my attention was called to the necessity of knowing the soil if we want to be sure of our product.

To come nearer home, I represent the heirs in a certain farm that is being conducted on shares. We have been putting commercial fertilizer on the soil, and heretofore I have always left the selection to the farmer; he would send in a bill for two-fifths of it, and I would pay it. I said "this year I want to look into it; I don't believe that we have been putting the right thing on that soil; what we need is nitrogen, and I want you to take a little can of the soil, and take it to Dr. Frear at State College and have him analyze it; I believe what the soil needs is nitrogen, and not potash." It is an old furnace quarry, in which they burned charcoal for many years. Dr. Frear's analysis bore out my impression, and I said to the farmer, "now we will have to get the nitrogen; we have potash enough." "But," he said, "I can't afford it." "Well," I said, "if you will take my way I will pay half of it instead of two-fifths, and then the difference will not be so much to you; it is the difference between $23 and $13, and if the crop then doesn't beat anything you ever had, I'll pay the whole of it." So on the strength of that our farmer agreed to do as I suggested. Well, the other day that farmer came into town to see me, and I said to him "Johnson, what would you say as to our prospects of a wheat crop next year?" "The best outlook I ever saw," he said. I don't know whether we will get so large a crop this year, as a good strong grain, that will carry with it the virtue of the nitrogen which we have put on the soil. Now, this proved to me that the great thing for every farmer to know is what he has in his soil, and what he requires to make it produce the crop he expects. Do you want a Baldwin apple? Ascertain whether the soil is suited for a Baldwin or for a Pippin, or for anything else. These learned scientists can tell you the reason; I can simply tell you the fact, that you must know what is already in the soil to adapt it for the purpose you want it, in order to produce the result.

Now, I believe that this is worth studying in Pennsylvania, and I believe that it would pay every farmer who has not already done so, to go up to the College and take a short course, and find out what there is in associating with these scientists, that they can tell you just what is already in the soil, and what you must put there in order to produce a crop. Of course, you may have a little round-a-bout way in finding this out for yourself. In order to secure results you may have to raise clover before you raise other things, to restore the nitrogenous food, but they can tell you that sometimes even clover won't do it; and they tell you to raise field peas and beans in order to prepare the soil to raise other crops. But the first thing to do is to ascertain what you have. That does not take any great knowledge; it doesn't take four years at college to ascertain how to do that thing. Why, I have heard what was to me a perfectly ridiculous proposition, come from no less a person that the man who has just been elected Prof. of Horticulture at State College. Between State College and Buffalo Run there is a stretch which has heretofore been called "the Barrens," and he assured me that these barrens could be made at least as productive as the sandy soil of New Jersey for market gardening. We all know what the people over there have done with the sands of New Jersey, and his proposition seemed to me just as ridiculous a thing as I ever heard, but he has a farm on the top of the Alleghenies, which he calls "Scalp Level," out of which he has made from four to five thousand dollars a year in market gardening. Now, if that is so, it is worth a great deal. These barrens, where all the timber has been taken off for the last hundred years to make barrel staves, until it is covered with nothing but pen-oak brush, can be made very profitable, he says. How? By analyzing the soil, and seeing what it wants.

That is the message that comes to me at this time, and it is a message that will help agriculture. Not that there is any science in it; it is only common sense. You don't draw on your bank account unless you put something in that bank, and then you can only draw out what you have put in, unless you are one of the favored few who are allowed to overdraw their bank accounts. The great thing here in Pennsylvania is to continue the soil survey which has been commenced by the Department at Washington. A good deal has already been done out in Centre County, and I think the good work will be continued if the Department of Agriculture is encouraged in it. A man by the name of Atherton, I think, has been telling the readers of the Saturday Evening Post that the land of Southern Illinois, which used to be considered the finest in the country, has deteriorated to such an extent that they cannot raise twenty-five bushels of corn to the acre. They have been planting corn for fifty years, and nothing but corn, and they have taken out of the soil all that goes to produce corn. We in Pennsylvania have done a little better, because we include clover; if we don't turn down the tops, we at least turn down the roots, and they give us the bacteria which we need, to keep up the fertility of the soil. Now, let us encourage the Department of Agriculture in every way we can to continue this work of soil analysis with us, so that we may understand just what we are doing, and what the soils require in order to produce the results we are looking for.

REPORT OF THE BOTANIST.

PROF. W. A. BUCKHOUT, *State College, Pa.*

My correspondence during the past year has been somewhat less than in former years and has involved nothing out of the ordinary. The same matters come up periodically year after year, and hence I need only briefly repeat what has been said before.

Seeds, particularly clover and alfalfa, come in for determination of purity. While samples of seed vary somewhat, none that have come into my hands are especially bad. They generally contain a few scattering seeds of various weeds, quite frequently of dodder, which is so small as to be difficult to detect. The danger from dodder, however, is quite small and local. Should it get a foothold it is easily destroyed by cutting before it has chance to form seed for another year. It is quite temporary. The greatest danger from impure seed of all kinds arises from the ignorance and inattention of the small dealers. If the business could be confined to those who make a business of seeds and take pains to inform themselves of the quality and character of their goods, there would be very little to complain of.

Weeds and plants for identification were in the usual variety. There is no "best" way to exterminate weeds, outside of the common sense of each case. Write to the Department of Agriculture, Washington, D. C., for "Farmers Bulletin No. 28, 'Weeds and How to Kill Them.'" Study your case as you would any other problem and act accordingly.

There is more or less inquiry respecting cultivation of medicinal plants. The one thing to remember regarding them is that they are so different and apart from the ordinary plants of cultivation that there is no similarity between them. It is absurd to talk of cultivating or raising them in the ordinary use of those words. Generally, returns from them come only after several years, during which time they must be cared for in peculiar ways and guarded from special dangers. An intending grower should carefully inform himself beforehand, as much so as one not a horseman should take a course in horse training before he enters the field with veteran jockeys.

The value of nearly all medicinal plants is small, when one considers the difficulties of production and the risks of handling. The same amount of energy in other directions would be more profitable. The most conspicuous example, ginseng, the writer has no faith in whatever. It has no medicinal value. Its use is founded upon ignorance and superstition. Its cultivation is bolstered up by "promoters," who are interested in selling roots and seeds at extravagant prices. Intending cultivators will do well to read the history of a somewhat parallel case, "The Multicaulis Craze," "The Evolution of our Native Fruits," by Bailey, page 141-158.

Plants for name take, of course, a wide range. Most of them have no economic value. As a general rule only meager fragments are sent. One of the most interesting cases I ever had, from the point of a mere detection or determination, consisted of a few dry stems, perfectly bare, perhaps three or four inches long, and a mass of comminuted fragments which could have all been held in a lady's thimble.

The lack of green leaves showed it a parasite; the presence of seeds, a flowering plant; character of the seeds and the capsules in which they were borne, a particular species, "beechdrops" (Epiphegus Virginiana). Its unusual appearance suggested to the sender a possible medicinal value, which it has not.

There were several cases of plant diseases. The most marked was of lettuce. This plant is raised in large quanities under circumstances which make it subject to several diseases which are often so serious as to prevent its successful cultivation. While these maladies are now well known to the plant pathologist, satisfactory remedies for them are very difficult to find, and still more difficult to employ. Since lettuce for table use should be clean and crisp any stunting of growth or even slight leaf imperfection makes it useless for market. Hence the most practicable remedy consists in stimulating a rapid growth in the plant in the hope that it will thereby be resistant to attack. Lettuce growers have by long experience determined the best conditions of soil, temperature, watering and light which the plant needs. Oftentimes their best efforts are thwarted by an insiduous blight or rot against which they are for the time being powerless. I believe that in many such instances the best thing to do is to temporarily abandon lettuce growing for a season or two, utilize the facilities for some other crop, and then return to lettuce raising again after the soil and surroundings have been freed from lettuce diseases. It will be the cheapest and most satisfactory in the end.

An interesting point was raised, whether barberry hedges are to be condemned because of the known fact that they harbor and support one of the stages of wheat rust, a parasitic disease to which wheat is subject. Since the life history of wheat rust is so thoroughly known and the part which the barberry plays in it, it would seem that there could be no room for doubt, and that barberry bushes should not be allowed. But we find, in our locality at least, that the barberry is but seldom infected, and true wheat rust is not a serious disease. Moreover, recent studies of rust have shown that it is capable of continuous development, independent of the stage sometimes found upon the barberry. Hence the presence of barberry bushes appears of at least much less significance than was formerly supposed. None the less, considering how easily a fungus outbreak may appear under conditions favorable to the species, it would be well not to use the common barberries so abundantly as hedges would require. As to Barberis thunbergii, the low growing Japanese species, now so popular for ornamental planting, the writer believes the danger to be so slight that it may be ignored, since the rust has never yet been found upon it.

REPORT OF ENTOMOLOGIST NO. 1.

By Prof. H. A. Surface, *Harrisburg, Pa.*

To me falls the duty of rendering to you a report of the entomological conditions in Pennsylvania during the year 1907. I have no way of knowing how much of my correspondence and service regarding insects is due to my position with this respected Board, but I know that in the capacity of Economic Zoologist of this Commonwealth our chief correspondence, publications and practical work has been along this line. We have, therefore, been in position to watch closely the outbreaks of injurious insects, the remedies that have been used successfully or otherwise in their repression, the enemies of insects and the appearance of literature upon this subject as well as the undoubtedly increased attention given it by the public.

We rejoice to say that with our other insect troubles, we have not been invaded with such destructive pests as the West Indian Peach Scale, the Brown Scale, the Gypsy Moth and the Brown Tail Moth. While we recognize the serious effects of the San José Scale and the great havoc it has played in this State we are certain that the conditions would be much worse were any one or more of the above named pests to be established within this Commonwealth. Therefore, it is important that we watch for them and guard carefully against their introduction, and should they become established it is necessary to take all possible means of stamping them out at once.

The worst pest, of course, attacking vegetation in this State is the San José Scale, which has been responsible for the destruction of millions of dollars' worth of fruit trees, and which is causing an annual loss of hundreds of thousands of dollars' worth of property in the State and reducing our fruit and fruit prospects. In many of the large fruit-growing districts two or three years ago nearly all the horticulturists were discouraged with it and ready to quit, but we are pleased to be able to report that now they have taken new courage and are producing almost perfect fruit in spite of the presence of the San José Scale. They are learning to keep such pests in check by the most simple, cheap and efficient remedies.

Where there is a great demand there will eventually appear a great supply. This State has experienced a very urgent demand for an effective and convenient insecticide. As a consequence, materials of many kinds have been placed upon the market. While we can not discuss here in detail the various remedies for the San José Scale, it appears important for us to say that it has been demonstrated beyond doubt that the best and cheapest remedy for this pest is the lime-sulphur wash:

17 pounds lime, 22 pounds sulphur, water to boil an hour, boil, strain and add water to make 50 gallons, and spray by giving two good coats over all the bark.

Fortunately, two or three companies are now making commercial preparations of the lime-sulphur compound, which are effective and which although costing a little more than the home-made lime-sulphur wash are not nearly as expensive as the commercial oil preparations now on the market, and this has the additional advantage over the oils of being a fungicide as well as an insecticide. It is our pleasure to report that the material made and sold as "Ska-Kill," at Waynesboro, Pa., has been withdrawn from manufacture and sale. It has proven entirely inefficient and unsatisfactory, as we indicated it would, and demonstrated it by actual test. We hope to see all commercial materials that fail to give satisfactory results properly exposed, in order that purchasers may act intelligently in attempting to suppress pests with such insecticides. For this reason, we deem it necessary to call attention to one of the so-called soluble oil preparations sold under the name of "Target Brand," made at Martinsburg, W. Va., which is reported to us from different sources as having resulted in the destruction of trees to which it was applied. It is important for our practical fruit growers to know that such unfortunate results have been obtained by their brother horticulturists and are liable to recur at any time and place.

Attention should be called to the experiments which have been conducted by the Division of Zoology of the State Department of Agriculture and of which publication has been made in the Monthly Bulletins of said Division. Practically all insect pests in this State have been therein discussed and formulæ for suppressing the same have been published in the May, June and July numbers. These may be obtained free by writing for them. Also the various Experiment Stations and the U. S. Department of Agriculture have published extensively upon entomological topics, and persons interested may obtain literature without charge upon almost any topic he may desire. Upon the insects concerning which we have had considerable correspondence in this State during the last year are the following:

Ants on lawns, in houses, in cornfields, attending aphids or plant lice, on fruit trees, and otherwise. We have shown that ants in lawns can be destroyed by making holes in the ground reaching to the bottom of their nests and into each hole pouring a half teaspoonful of Carbon Bisulfid. From houses they are best exterminated by tracing their path or line they follow to their nests and pouring benzine or gasoline into the nest to destroy the queen. Ants in cornfields, in the spring, have proven annoying, not by their direct injury, but by taking care of the plant lice which infest the roots of corn plants and prove quite obnoxious. To overcome this it is best to plow the ground in the fall, and cultivate it as late as possible until it freezes, and in the early spring cultivate again with a spring-toothed harrow, then harrow it later and plant the corn late after having kept down the weeds and grass of early spring. Many persons see the ants on trees or shrubs and ask for a remedy. It is not the ants that should be remedied, but the plant lice, which are attracting these little insects. Many ants are seen going up and down trees, and it may almost always be taken that it is because either plant lice or scale insects are present on the branches or leaves of the trees, and by the sweet secretions called honey dew, they are furnishing food to the ants. Contact insecticides ridding the trees of suctorial pests will soon result in the disappearance of the ants.

Aphids and plant lice have been the subject of a great deal of correspondence. They are especially liable to appear upon the leaves of trees during the early summer and cause these leaves to become deformed or twisted out of shape. Within the leaf and upon the branches beneath them, as well as upon the ground, are often found glistening or shiny drops and rather black sooty spots. These shiny drops looking like honey are called honey dew, and the dark spots are the results of a fungus developing in the honey dew. The best remedy for plant lice is to spray with contact insecticides, such as one pound of whale oil soap dissolved in six gallons of water, applied just as the buds are bursting, or the lime-sulphur solution applied as for San José Scale, applying it after the buds swell and just when the first of them commence, to burst and show green. We have sprayed trees with the green leaves quite apparent and the pink of the blossoms commencing to show, and have killed the scale insects and plant lice without injury to the leaves or fruit. The lime-sulphur regularly recommended was used for this.

The apple aphis passes the winter in the form of eggs on the branches of the trees, and is thus easily reached by a good contact insecticide. I have also had very positive reports of the cherry aphis, sometimes called the brown plant lice, having been destroyed by the spring application of the lime-sulphur wash for San José Scale. In some portions of this State the Green Louse or Plant Louse on the potato has been so abundant as to have proven destructive, but it can be held in check by spraying with whale oil soap solution or strong decoction of tobacco or eight per cent. kerosene emulsion. The Gray Maple Aphis has caused a great deal of alarm by its appearance on the under sides of Norway maple shade trees along streets, and causing the leaves to fall abundantly about midsummer. While this was unusually abundant during the past year.

we do not generally consider it such that it is necessary to take practical steps for its control, but if such should be thought necessary, it should be sufficient to spray thoroughly with a mild contact insecticide.

The Wooly Aphis is a very serious orchard pest. This little bluish white plant louse is to be found in most orchards where the bark has been slightly injured. It attacks the branches, the trunk or the roots. By looking around the edge of the injured spot a bluish-white ring may be often seen. Upon examination this is found to consist of these little pests, sometimes looking as though covered with flour. It is best to treat them either by spraying or by washing the injury with a brush dipped into a mixture of pure white lead and linseed oil or a very strong solution of soap or soft soap. Where this occurs upon the roots of trees, it is advisable to bury an abundance of tobacco dust around the roots. This not only acts as a very good orchard fertilizer, being worth about at least twenty dollars per ton for this purpose, but also acts as a valuable insecticide in destroying such pests as Wooly Aphis and other root-infesting insects.

Bagworms have attracted considerable attention by their unusual numbers and destruction of foliage, but as these are so easily seen while the trees are dormant, and so easily killed, both by hand picking at that time, and by spraying with arsenical poisons after the leaves appear, there is no reason why injury should be experienced by this pest. Household pests, such as Cockroaches, Bedbugs, Flies, Fleas and other insects, have been the subject of much inquiry, and have been controlled satisfactorily, and in fact in many houses were entirely exterminated by thoroughly and properly fumigating with hydrocyanic acid gas. There is no reason why one should suffer from such pests after having been informed of the efficiency and ease with which they can be exterminated.

The subject of bees and bee-keeping has received considerable attention from the members of the State Bee-Keepers' Association and others, and several persons have tried bees of the various races. It is generally accepted that the Italian is the standard race of bees known to American bee-keepers at present.

Among beetles, the Asparagus Beetle has been extending its range over the State, but as this is easy to keep in check by dusting with freshly slaked lime, or with flour and Paris Green, one part of the poison to forty parts of flour, there is no reason why it should be very destructive. The Striped Cucumber Beetle was abundant and injurious in most parts of this State, but is prevented chiefly by covering the plants with netting until the vines start to run. The unquesionably good effects of Lady Beetles as destroyers of obnoxious insects, and especially of young scale insects and plant lice, are noted many times. Also the value of the Ground Beetles as predaceous insects in destroying larvæ and other insects. Bark Beetles have continued to bore their little round holes through the bark of trees that are declining and hasten their death, giving the appearance of having been in many cases the sole cause of the trouble. It is to be remembered that wherever a branch is dying through having become broken or otherwise, the Bark Beetle is ready to attack it, and oftentimes we see the work of the Shot-

Hole Borer, and as this is in a tree that is already dead or dying, we think it is more destructive than the facts warrant. If trees are so declining as to be attacked by the Shot-Hole Borers, they should be cut and burned, and thus prevent the spread of the pests to other trees.

Borers of fruit trees have been unusually active, but the fruit growers have had another year to test the efficiency of pure linseed oil and white lead used as paint, applied during the early part of the summer to prevent such pests as well as later ravages by rats and mice. We have seen thousands of apple trees so painted and no injury has come. In fact we have tried it in our own peach trees, and although this was done last summer, we can not yet report injury, yet we still call attention to the fact that the Peach-tree Borer is an insect that works lower in the ground, and is not to be prevented by this method. Therefore it is scarcely necessary to paint any but apple, pear and quince in order to prevent the attacks of Borers. The Peach Twig Borer has occurred in this State as a comparatively new pest. It is to be destroyed by the regular formula for spraying with the lime-sulphur wash for the San José Scale and at the same time of year as recommended for this pest. The Borer in potato plants and many other forms of vegetation has proven quite destructive and has attracted considerable attention. Since this lives chiefly in large weeds or rushes, like bull weeds and artichokes, it is very important to destroy these larger weeds by mowing them two or three times during the summer. This pest can then be kept in check by thorough cultivation of plants and by burning as soon as they appear to wilt from the effects of its infestation.

The Cabbage Root Maggot has been unusually severe and has destroyed much of the early planted cabbage as well as turnips and radishes. Our experiments have proven that it is best to prevent this by putting a band or disk of tarred paper around the plant at the time it is set. These can be cut very rapidly with a punch somewhat like a wad cutter for gun wads. They should be nearly ten inches in diameter and slit in the centre to let them be passed around the plant. If plants be not thus protected and later be infested with the Rootworm, this pest can be killed by treating with carbolic emulsion as discussed in the Monthly Bulletin of the Economic Zoologist for March, 1907. Fortunately, the late cabbage is not infested with this pest as much as is the early planted, and therefore, it is recommended to plant late that which is needed for the winter supply and for making sourkraut and the chief family use of the year.

The Green Worm or Larvæ of the White Butterfly has not been known to be so destructive during the past year for the reason that the more extensive gardeners and truckers have now learned to control it by simply spraying with arsenate of lead or Paris Green applied at any time when the pests are present and before the heads are three-fourths grown. Also dusting with Flour and Paris Green while the leaves are damp with dew will prove effective. Use one part of Paris Green to forty parts of Flour. We know where poisons have been used on cabbage for this pest for years without evil results.

Cabbage Plant Lice have proven quite destructive and should be killed by spraying with whale oil soap, one pound in six gallons of water, or similar insecticide are recommended for Aphids.

The Curculio has been as abundant as ever on peach, plum, cherry and quince, but is being held in check by many orchardists by spraying with arsenate of lead in Bordeaux mixture and combining this with jarring of the trees in the morning to catch the pests.

A few correspondents reported Cutworms in abundance, but this was only on sod ground, and where the ground was plowed in the fall and the insects exposed by late fall and early spring cultivation, they were not found so destructive. Also their experiments in using poisoned bran for these pests were very successful, as was published in one of our bulletins for last spring.

The European Fruit Scale, Forbes' Scale and Putman's Scale are species of the genus Aspidiotus, thus belonging to the same genus as the San José Scale and closely resembling the last-named pest. They have been found very extensively by our inspectors and it is not infrequent that an error is made by confusing these with San José Scale. They are not so destructive and need not cause undue alarm. Flea Beetles have been present and especially destructive on potatoes by gnawing holes in the epidermis and making the leaves appear to be specked with brown. However, they are repelled or destroyed by spraying with Bordeaux mixture with an arsenical poison added.

The grain pest known as the Angoumois Grain Moth has continued its destructiveness, especially in the southeastern portion of this State. However, we have had some excellent reports of loss prevented by this pest by threshing the grain early and getting it into the bin rather than leaving it in the straw. One person in particular reported to us that he had threshed about one-half of his crop shortly after harvest and the other half was left until the early part of the winter. The former was not injured by the Grain Moth, while the latter was practically destroyed. This is in accordance with our recommendations.

Grasshoppers have been observed by us as serious enemies of fruit by gnawing peaches through the skin at the upper side as they are ripening, especially during the very dry part of the year which, of course, is the growing side, and resulting in decided blemishes. We have also had reports of their destroying tobacco and eating the leaves and fruit of melons. We recommend poisoning them with the Criddle Mixture or spraying with sweetened arsenical poison. The Criddle Mixture is discussed in the Bulletin of the Division of Zoology for last May.

The Hessian Fly has not been so destructive as during some years, but as usual the wheat planted early has been generally infested more or less.

Lady Beetles as beneficial insects have been reported from a great many different sources. Leaf Hoppers on rose, apple and potatoes have been injurious in some places, but have been destroyed by two or three applications of contact insecticides, such as are recommended for plant lice. Maggots or the larvæ of the flies in raspberry canes have appeared in some parts of this State, thus causing a wilting down of the tips during the summer. They should be cut and burned when found infested. The Mediterranean Flour Moth has been destructive in mills and graneries in the eastern parts of this State, and it has also spread to the extreme northern or western portions of the State, but has been cleaned up satisfactorily by two fumigations at intervals of about one week with hydrocyanic acid gas. In some of the larger mills this operation has cost over fifty dollars for the fumigation, but has given very satisfactory results in destroying all insects in the building as well as mice and rats by the bushel.

Mites, especially the Red Mites, have been reported injuring many varieties of trees, shrubs, ornamental plants and shrubbery, and have been controlled by spraying with the lime-sulphur wash, the same as for the San José Scale, or with contact insecticides containing Sulphur or Sulphur Compounds. Slugs on cherry and pear trees have been very abundant and destructive, but easily killed by dusting with freshly-slaked lime with about one-fortieth part of Paris Green added. Spraying is becoming far more extensive than ever before and our citizens are producing better fruits, planting young orchards and having better results and a more hopeful outlook than has previously been known in this State.

THE AGE IN WHICH WE LIVE.

BY R. M. HEYBURN, *Ward, Pa.*

In presenting this subject, the age in which we live, I am remindful of the fact that it is a scientific as well as a practical age as it applies to agriculture. Now and then we see a farmer who speaks of the slavery of farm life; true, he has a share of burdens to bear; so have men in other vocations of life. The farmer's life is just exactly what he makes it. Many very excellent people whose characters are noble pass many an hour of sadness and weariness of heart looking for trouble that never comes. The fault is not their circumstances, nor with their general character, but with themselves. Many of the young men on the farm scan the pages of daily papers looking for a job in the city, as they want to be something better than a farmer. Yet it is not likely that talents of all young men need be hidden under a bushel by settling on a farm, for there are plenty of opportunities in all walks of life. The farmer of to-day must let his light shine before men that they may realize bad or good work, for this honorable calling, so considered by Washington, requires men of the best intelligence and enterprise, men of integrity and backbone, able to run their farms in an intelligent manner and on business principles, and take their position with honor in the social and commercial world. Many farmers attain success through much quiet home study, by reading the best agriculture literature, and journeying by the slow but sure road to experience. They are thoughtful and intelligent. Every farmer wants to make money, he wants to make it at the smallest outlay of labor and money. By beginning carefully and moderately every farmer will seek his particular station; he can later attain the more supreme stage of business, should his judgment lead him in that direction. Farming is a great science and in no better way can a young man make his influence felt among his peers, or tone his life work to the spirit of the time than on the farm. Whether on the farm, in the factory, store, school, or elsewhere, the person who thinks, works and sticks to it will come to the front, combined with the scientific teachings of to-day. The farmer's occupation stands without a rival. How many men, successful in other lines of work, grow tired of the strenuous city life, and gladly return to end their days, having proved there is nothing better than a farm life.

The farmers who to-day are accomplishing the best results in their work, and at the same time getting the most satisfaction out of it, are those who not only make a first-hand study out of the conditions which they find on their own farms, but take advantage of every helpful hint and suggestion which they can get hold of coming from their State Agricultural College and Experiment Station. A German authority on social and economical problems has recently issued a statement in which he declares that the professional vocations, medicine, law and teaching, are already overflowing, and advises German young men to fit themselves for careers in scientific agriculture. While conditions in the old countries of Europe do not correspond in all respects with those that prevail in the United States, it is becoming more apparent every day that the professions above referred to are already full in this country; thousands of professional men in cities, large and small, all over the country receiving barely enough to make both ends meet. On the other hand, the agricultural colleges of the country do not begin to turn out men fast enough to supply the demand for experts in the science of animal husbandry, farm crops, soils and dairying. The greatest material problem of the coming years is going to be the feeding of an ever-increasing population, and the young man who fits himself thoroughly along any or several of the above special lines, with a view to supply this great need is sure to have a job waiting for him when he is qualified to handle it. There is certainly a great future for young men of this type. This world needs workers and thinkers, not shirkers. This is just as true on the farms as it is in the halls where laws are made for the nation. We hear a great deal in these days about abandoned farms of the country. There are no doubt a good many places where the light has gone out of the window, there is no fire on the hearth, the buildings are tumbling down, things are at a standstill and the wise men have done a great deal of speculating over the matter. Some think we need to discover some new way of making these deserted farms more productive. No doubt it is alright to make farms produce all there is in them, and the farmer that does not try to do this will never be a success at farming. After bountiful crops have been raised the most important problem that confronts us is the proper marketing of such crops. If there is a defect in the education of the American farmer it is his lack of sufficient training on the purely commercial side. There is an old proverb to the effect that a crop well grown is half sold, but in our day the best-grown crops may bring a poor price if the seller is unable to market it advantageously. He must know how to make his products attractive to the eyes of his customers, and above all practice no deception. Reputation is the standard by which a man should be judged; reputation for square dealing once acquired a man has won his greatest laurels, and can command fancy prices for his marketable article. The farmer should study the markets, and his mind should be trained to project itself so that he may forecast values, and he should be self-reliant enough to decide offhand the proper course to pursue. A generation of farmers so trained and possessed of the skill that now goes with agriculture everywhere, will be the power that will regulate the world. I am convinced that the best place to live is in the country, where the surroundings are healthful, the temptations few and the contact with nature and all her workings are elevating and inspiring. Almost all the men in America who have reached great distinction in the various fields of human endeavor have been country-bred. There is practically no limit to the opportunities of men in these days, who have inherited health and moral stamina, and have been brought up in the country, for, from these are to be recruited the great men of the future, the men who will do things and uplift the world by their efforts.

The causes for deserted farms, in many instances, are not on account of not producing good crops, but from a lack of good, gritty men to operate them and not receiving better returns for crops produced. It does not take a wonderfully smart man to pull up stakes and move a way off somewhere. Trains are daily carrying people who are looking for something better than they use to have. Many of these same men, if you meet them a few years from now, you will find them still on the move; their time is spent in moving. We have all known young men left well off with good farms and money beside, who should be the happiest men in the world. The trouble often is they think the farm will always stay good, money never run out. About the next thing he does is to buy a horse fast enough that he won't have to take his neighbor's dust. This man never knew how to work, neither did he want to, while time rolls on, money gets short, the farm gets poor. No fault of the farm; these are simply cases of taking life easy, while their best days are passing away. Then they say farming don't pay. It is generally the fault of the man. Sometimes existing conditions are hard to remove; difficulties are but opportunities to test our ability. There is great power and effectiveness in wisely-considered organization in everything. We can see it to-day in public affairs. See how powerful the great Trusts have become through far-reaching organization. Organization means simply the best arrangement of knowledge and energy to carry out some given purpose.

Every efficient man needs to have a well-organized mind for his business. He needs, in the first place, abundant knowledge of all the forces he is dealing with; second, he needs to have that knowledge arranged in practical shape so he can go at it and use it at once when needed; then he needs energy and skill to carry out that knowledge. Take the dairy farmer. What is he dealing with? He is dealing first with the soil. He needs thorough knowledge of soils, how to handle them and improve them. He should study the best thought and knowledge of the wisest men who have written on the subject. He should know something of the nature, construction and chemistry of the soil so that when he reads on this subject he can understand the terms used. How fortunate it would have been for the present generation of farmers if they had been taught in their youth, in the country school, the meaning of the terms "Agricultural Chemistry" the same as they were taught the meaning of the terms used in arithmetic. Besides the soil, the dairy farmer is dealing constantly with animal life of his farm; he needs sound knowledge of the physiology of that life to care for feed, and manage it so it shall be carried to its highest degree of efficiency. Then there are questions of fertilizers for soil, of wise feeding for this, that or other purposes, and many other questions that pertain to this life on the farm. Then he needs a knowledge of how to organize the farm itself, so that it shall be in harmony with the great purpose of dairy farming. All this must start in the mind of the farmer himself. If he has a stock of well-stored, well-organized knowledge, if he knows what needs to be done and how to do it, how to arrange forces for final accomplishment, then we have the dairy farm full of the meaning for its final purpose. On such a farm there is ample opportunity for any man to exercise the very highest power, the finest training of mind and hand, the deepest scientific knowledge, and the best of executive ability. What is needed on the American farm to-day is a man who believes all this. Farmers talk of lack of capital. What they need most is this larger, truer comprehension of the meaning of the problems they are dealing with. Once this is understood, then order, organization, efficiency follow, and wealth ensues. No farmer can secure wealth without a well-organized mind, and business without these qualities, if a man had capital it would be wasted, as has been done in thousands of instances. As this applies to the dairy, so it does through all the various channels of agriculture. When the farmers of the present age once become educated in modern principles of agriculture, together with a determination to succeed, they have a bright future.

One of the most serious problems that confront us to-day is the lack of competent farm hands, with all the up-to-date machinery on the farm. The question is still a serious one; particularly is this true when only a few miles from a large city. The problem of the hired man faces us with a persistence which demands attention. Little use to inquire what is the cause of this dearth of farm help. High prices are offered, fair treatment is assured, still the farm work drags for lack of the hired man; and there is a disposition to shirk the work on the farm and cling to city life with its uncertainties, and the struggle goes on. The farmer needs the help of the man in the city; the man in the city needs the work to be had outside; still the two are far apart. The farmer wears himself out in the endeavor to keep the farm up to his ideal, and perhaps at last rents the place and moves away. The farm runs down, and finally the shutters are put up, another light has gone out. The work of educating the young men to come back to the farms is going on, however, and it will not be long before we shall have growing up about us an army of strong-limbed, intelligent young farmers. It is all right that these should go away for an education; they cannot know too much; they will be better farmers for their knowledge of books. And the wise farmer who has a son inclined to make farming a business cannot do better than to make that son such an offer as will decide him what is the best thing to do. That will solve the problem for two men and their families at least. Let us hope we have seen our worse times to secure competent help on the farm. Not only is this true of the farm, but help within the household is just as difficult to get help. In many cases the overworked wife and daughters are compelled to assist with outside work in order that the most important work may be accomplished. The European governments which are being drained of their young and best workers to supply the demand of the labor markets in America are beginning to view with alarm the situation, and efforts will be made to stay the tide of emigration by the improvement of home conditions.

These efforts, if they are made with any determination and concert, must invariably complicate the labor problem in this country and add to the trials of farmers, who in many sections, are facing the help question with a good deal of discouragement, and will make it more imperative for the farmers' sons to remain at home. Some people think it better to have smaller farms. On the economic side is to be credited the greater personal attention that can be given to each acre, animal and process, and better work than can be given on large estates through hired labor, less destruction of tools, less waste and distance to work. A farm of one hundred acres is 127 rods square, and one of three hundred acres is 220 rods square. The average distance to the field work of one is 73 per cent., or 23 rods less than to the other, and 2 per cent. so far as crop work is involved. If one's normal working powers are used in travel on the large farms it is not destructive, but would be important on 1,000 acres. Large farms invite genius, men of great organizing and administrative powers, and make possible a high order of culture and living. There is now no obstacle in the way of men of this class applying their talents to land, nor no valid opposing reason. Present conditions invite captains of industry to marshal their forces over the green fields and furrowed grounds. Machinery, the genius of the times, compells or demands breadth of action for economy of operation. The trouble of the small farm outside of gardening and fruit growing is that the limit of its income is below the demand of living in the Twentieth Century. I have a friend 15 miles from market growing staple crops only; he is one of the best of farmers and his gross income is $75 to $80 per acre. His profits per acre are large, yet though a man of moderate expenses, of good habits, industrious, able, he has little or no income of family expenses. He has ambition and capacity for larger operation. On some farms 35 acres of actual tillage area will cover the amount found on many farms of 100 to 150 acres, the remainder of the farm returns but a mere nominal, almost negligible income, say $20 per acre net; 35 acres is but $700, and can leave but little after taking out the essentials for living in our times. One hundred acres at the same rate would net $2,000, a respectable sum, even though the profit per acre is reduced to $15, because of reduced efficiency under broad farming, and the result is but $1,500. There is something for the higher life left. In these times the man with 100 acres will have less trouble in keeping help than where there is only one; the more men you keep the easier it is to get help.

One great trouble with the farmers in these days is, they do not understand the terms or words used by writers when discussing farm subjects, such words as "leguminous plants," "balanced rations," "inoculation," "humus material," etc. Many farmers have a wrong notion about these terms. They think they could be expressed in plain, simple language. Such words are mainly used in Agricultural Chemistry, and there are no other words equivalent to them. It is the same with the words "telegraph or telephone." Both are Greek words, and there are no other words that stand for the same meaning. Farmers as well as other classes found no difficulty in learning the meaning of those two words, and they use them readily. It is so with the terms in agricultural literature. We acknowledge that the farmer can not get the true meaning of any article unless he can understand the meaning of the language it is written in. But the true logic of that situation is that the farmer should at once learn the meaning of such words in order that he may gain the knowledge they convey. Right there comes in the great advantage of studying these questions and terms in the common school when young. Where will he be in after life unless he learns their meaning? Thousands of good men to-day can not read their farm paper as intelligently as they wish, just because in their country district school, when boys, they were given no education in these things. All thought, experience, knowledge, is conveyed from one man to another by the use of language. If we can not understand the language we derive no instruction from it. It is a dead language to us. There is no reason why he can not educate himself the same as thousands of others have. By the aid of a dictionary he can learn the meaning of any term used in books or papers. Think how much more of a man he will feel himself to be, and how much more of a man he really is, if he can readily understand the meaning of the articles that are written for his enlightenment. It is a good plan whenever a Farmers' Institute is announced in a neighborhood, for those who expect to attend to save up the knotty problems they encounter in their reading and experience and propound them for solution to the Department's representatives. This would not only make the institute more interesting and instructive, but would also put the lecturer on his mettle and compel him to be of the class that knows he knows. As common people we are surrounded on every hand with the thought, the work, the results of science to the final meaning of our civilization is applied science. It is applied in the buildings we live in, the food we eat, the clothes we wear, etc. Indeed, it is the essence of the life we live. Why, then, should the farmer be so afraid of science or scientific men? Why should he have a prejudice against them? Every improvement that has come to him through life has been brought out through science, and yet there are thousands of farmers who sneer at science and scientific farming. (Science is the organization of the common knowledge of the common people.) A farm is a common thing, but a well-organized, thoroughly efficient farm is very uncommon, and so, there are many men on farms who know enough if they would arrange their knowledge into practical, workable shape, they would prove a success. To know, and to know what we can do with what we know, this is science. Is there any reason why the farmer should be prejudiced against it?

THE FARMER AS A CITIZEN.

With the broadening outlook of the farmer consequent upon the improvement in agricultural methods, and this improvement has been greater than we art apt to think until we go back a way in history and compare the present with the past, he is becoming more and more interested in the things that relate to government, national, state and local. Becoming more and more a factor in public affairs, a bigger man and a better citizen. This is as it should be. Too long has the man on the farm been willing that the lawyers and the business men should run affairs of state; too long has he been content to take his economic and political ideas at second hand, with the inevitable result that when false principles were advocated and adopted he was powerless to assert himself and demand a better order of things. The result is that we have fastened upon the country a system that makes it possible for the combines in the city to fix such low prices upon the products of the farm as to render the loss of the farmer frequent, while they fix the price of the same article to the consumer at a figure so high as to discourage consumption. Viewed from no higher standpoint and his own financial welfare, therefore, the farmer finds it necessary that he shall take his full share of the responsibilities of citizenship, and develops a mental grasp and a resource in information that will enable to command the attention and respect of his fellow-citizens in every walk of life. The agricultural college and the farmers' institute are doing great things for the farmer in this direction, and it is gratifying to note how rapidly are coming into public notice men from the farms who are distinguishing themselves by their ability to discuss with largeness of view the important questions of the day. When the American farmer takes his rightful place in the affairs of the country there will be less to complain of in government, and justice will be its dominating principle.

REPORT OF VETERINARIAN.

By Dr. Leonard Pearson.

I have to report to you as Veterinarian of the State Board of Agriculture in regard to the health of the animals in the last year, and the work of the Veterinary Sanitary Division of the State Board of Agriculture. The work of this Division has been directed against tuberculosis, as has been the case in all previous years. It is not that other diseases do not exist, or that we do not care, but tuberculosis prevailed so largely, and made such inroads on the livestock throughout the State, that the State Board of Agriculture felt called upon to devote its energies to fighting this disease more than any other. Nor is it that tuberculosis is becoming more prevalent; it is becoming less prevalent in Pennsylvania, decidedly so. This is due to the increased desire on the part of owners of herds to free their herds from this disease, and this is but the expression of a great movement that is sweeping across the State, across the country, and I might add, across the world, against tuberculosis. This disease has increased until it has come to be the chief cause of mortality among animals and men, and more destructive than small-pox and the Bubonic plague and cholera, and all the other plagues combined.

Now, the movement that is being introduced against this disease is destined to become one of the great historic movements. The people have become aroused to the question. These historic movements sweep across the country at intervals; sometimes they are economical movements, sometimes great religious movements, sometimes movements relating to the physical or moral health of the community. You know it was the great movement against slavery that divided the country into two armed camps; then it was the great temperance movement that aroused the nation; now it is the great movement against tuberculosis, and I believe that it will exterminate this disease. In past years small-pox and leprosy and other dread diseases have been exterminated by just such popular movements, and I believe it will be the same with tuberculosis. Of course, this will not come at once. It will take years, but a great International Tuberculosis Congress is to meet at Washington next September. It is believed that this will be the largest meeting that has ever been held regarding this disease. It is not a medical meeting, but it will be participated in by people of all nations who are interested in the subject, and it is expected that there will be two thousand delegates from foreign countries. I mention this to show the force of this movement against tuberculosis, and I say it is bound to be successful, but not immediately. The Department of Agriculture in New York State has at last aroused itself, after many years' slumber, to the great question of tuberculosis among cattle. They have made examinations in various parts of the state, and have come to the conclusion that about 20 per cent. of the cows in New York State are tubercular. From what I have seen, I should say that this is about correct, and as they have 1,800,000 cows in the State of New York, it would follow that approximately 400,000 are tubercular, and yet one of the members of the Department of Agriculture in that state—the Deputy Secretary—

MR. HUTCHISON: Was it Flanders?

DR. PEARSON: Yes; it was Flanders—told me that they expect to be able to control it in three months. Why, the cost of exterminating that disease in that number of cattle would approximate $20,000,000, the entire revenue of the state for a year. This shows that they don't know what they are taking hold of. We have been at the work since 1896, and tuberculosis has steadily declined; we have, I should say, one-third less of tuberculosis than is supposed to exist in the State of New York, and the expenditures have not averaged over $35,000. It is more this year, because the Livestock Sanitary Board has other lines to carry out, but we have expended less than $400,000 since the work started a little over eleven years ago. When you take into consideration that there are over 2,000,000 cattle in Pennsylvania, you will find that this appropriation of $35,000 is somewhat less than two cents a head for each bovine animal in the State. That is a very cheap insurance, I think, and from results, we may be justified in congratulating ourselves, I should say. At any rate, other states are now interested in the character of the work that is being done in Pennsylvania against tuberculosis, and they are continually making inquiry with a view to taking up the work on similar lines.

I don't know that it is necessary to say anything about the present plans for the work against tuberculosis; they are all known to you. As you know, it is largely a matter of co-operation between the owners of infected herds and the State Livestock Sanitary Board. The chief objection we have is that we cannot make the examinations rapidly enough—as rapidly as the owners would like. Where we cannot make an examination, we frequently advise. The advice is free, and a good deal is accomplished in that way.

There is another disease, glanders in horses, that has proven rather destructive in large cities, particularly Philadelphia and Pittsburg, and in other parts of the State, where there is importation of horses from other states. It seems that there is more glanders than usual in the state where we get our horse supply, and the high price of horses has tempted the importation of infected horses under circumstances which would otherwise not have occurred. We have found it, for instance, in shipments of mules from East St. Louis particularly to the mines, and in some cases they contracted the disease before we knew it. There is a law against the importation of such animals, and there is now a penalty for the hiding of this disease, so we are getting closer to it.

Rabies is another disease that requires attention. There are now several districts in the State where the dogs are under quarantine by the State Board for rabies. There have been a number of deaths of children, to say nothing of cattle and horses. There are too many dogs in Pennsylvania, as I am sure you will all agree. The matter of taxation of dogs has been a very important one, and as you know, through the efforts of the Department of Agriculture, a bill was passed last year requiring the licensing of all dogs, and requiring the County Commissioners to furnish a tag bearing the name of the owner, to be attached to the dog, and requiring the shooting of dogs that have no such tags; but in some parts of the State this law has been deliberately ignored, so that we might just as well not have any law, so far as results are concerned.

Hog cholera practically does not exist in Pennsylvania except where hogs are brought in from other states, and in this case the hogs are at once placed under quarantine, so that we have but little trouble with this disease.

Just a word as to one or two new diseases, or rather as to one old disease, and one new disease that we have recently discovered: It is called Epizootic Larynphangitis. When it was told the Governor that this disease had appeared in Pennsylvania, he said, "My gracious! but that must be a terrible disease," and as a matter of fact it is. It is caused by yeast that has the organism of the vegetable parasite of yeast; it starts in the larynx and spreads to other parts of the body through the lymphatic glands. It may be cured, however. This disease appeared in Beaver and Jefferson counties last fall. It had never before appeared in North America. It has been known in the Philippine Islands and in South America. It was carried to South Africa during the Boer War, and from there carried into England and Ireland, but how it came into North America, or into Pennsylvania, we don't know. The diagnosis is there, but where the disease came from, we don't know. The supposition, however, is that it existed for a long time without being known, and that outbreaks of it have occurred in other states. It exists now in New York and Ohio, and we have about one hundred and seventy-five cases of it under quarantine.

Now, the other disease that is not new is the dysentery occurring in cattle. It has existed in the State for quite a long while, but until recently, it was not discovered. It has existed in Europe for many years, but we did not discover it until last year. It is caused by a bacillus that in some respects rather resembles the germ of tuberculosis and in other respects differs widely from it. It occurs in the lining of the large intestines. The effect of it is that it causes dysentery, and brings about a decline in the general condition of the animal. The animal becomes weak and aenemic, and is likely to die. Now, since we know that it has appeared, we are making every effort to control it; it exists in Chester county, and in the parts of Bucks, Berks and Northampton. If it exists in other parts of the State we are not aware of it.

A BETTER AGRICULTURE AND HOW TO GET IT.

BY PROF. JOHN HAMILTON, *Farmers' Institute Specialist, Office of Experiment Stations, United States Department of Agriculture, Washington, D. C.*

The crop yield of the United States has reached enormous proportions. The recent report of the Secretary of Agriculture, in speaking of cereals, announces that in the year 1907 the corn crop was 2,553,732,000 bushels; the wheat crop, 625,576,000 bushels; oats, 741,521,000 bushels; barley, 147,192,000 bushels; rye, 31,566,000 bushels; rice, 21,412,000 bushels, and buckwheat, 13,911,000 bushels. The farm value of the cereals for the year is estimated at $2,378,000,000. Added to the cereal crops are hay, cotton, sugar and tobacco, and the enormous income from the dairy, poultry and livestock interests, making a grand total of addition to the national wealth from agriculture alone of $7,412,000,000. These figures represent quantities of produce and an income of wealth altogether beyond our comprehension.

In the face of such figures how is it possible to justify the expenditure of millions of money, and the employment of thousands of skilled experts to secure a better agriculture, to improve that which has already grown to dimensions beyond our ability to comprehend?

Upon the proceeds of agriculture about 35 per cent. of our population are dependent for their living. Before, however, the products of the year can be enjoyed there must first be expended vast sums for rent of land and buildings, implements, labor, fertilizers, taxes and other expenses. Whatever is left is then available for the maintenance of the agricultural population, and for addition to their accumulation of surplus wealth. Accordingly, the aggregate income of a nation, or an individual is not of itself conclusive evidence of unbounded prosperity. The cost may be greater than the income, and the individual be left at the end of the year worse off than at its beginning.

I have thought that it might be interesting and perhaps instructive to take some of the items of our production and analyze them with a view to discovering their precise status as contributors to the general prosperity of the country and to the wealth of farming people. In dealing with the great problems of agriculture it is necessary to follow to some extent the methods of the chemical analyst and deal with units or small areas. The chemist in undertaking to discover the truth respecting the composition of a substance does not analyze the entire mass, but selects a sample, and divides and sub-divides it until but a small quantity is finally selected, and with this he conducts his investigation. The individual farmer and the land that he tills correspond in this instance to the chemist's sample. The various operations, crops, animals and soils with which he deals are the component parts which exhibit the true condition of the business. The abundance, average condition, cost of production and degree of perfection of the product show at least approximately, the condition and profitableness of the industry as a whole.

WHEAT PRODUCTION.

Perhaps no single crop is grown more universally throughout the United States than wheat. From the northernmost States to the Gulf, and from the Atlantic Coast to the Pacific, every State in the Union reports a greater or less acreage of this cereal. Inasmuch as quite accurate data extending back through many years are at hand respecting the products of this crop, it is possible to ascertain with considerable accuracy and definiteness the actual conditions under which it is produced.

In the past ten years the annual wheat crop of the United States ranged from 522,229,505 to 735,260,970 bushels. The average annual production, however, for the ten years from 1897 to 1906, was 631,181,626 bushels. The average yield per acre in the United States for the decade 1897 to 1906 as given by the report of the Department of Agriculture for 1906 was 13.8 bushels, and the average annual yield from 1871 to 1906 was 12.69 bushels per acre. The averages per acre according to periods were as follows: 1871 to 1876, 11.70 bushels; 1877 to 1886, 12.51 bushels; 1887 to 1896, 12.66 bushels; 1897 to 1906, 13.82 bushels, and the average for the entire period from 1871 to 1906 was 12.69 bushels. The annual average value of the crop for the decade, 1897 to 1906, was $9.48, and for the entire thirty-six years from 1871 to 1906, $10.28 per acre.*

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*Report of Department of Agriculture, 1906.

COST OF AN ACRE OF WHEAT.

When it is remembered that the cost of production of an acre of wheat in the Eastern part of the United States is about $12.50 but little argument is needed to show its status in the list of profitable crops in that section. While the cost of producing an acre of wheat upon the new lands of the great West, where wheat is grown as practically the only crop, is at present much less than in the older wheat districts of the East, nevertheless the fact that the entire wheat acreage of the country averaged but $9.48 per acre for the last decade, shows that the margin of profit even under the most favorable conditions is comparatively small.

That wheat is not an exception to other cereal crops in its value per acre is seen by the Census report for 1899, which gives the average value of all of the cereals taken together at but $8.02 per acre. When it is remembered that of the acreage of all farm crops in 1899, 63.8 per cent. were cereals, we can understand how vitally this low production affects the farming interests of the country. While it is true that some farmers receive much greater income per acre from their cereals than the average indicates, yet an equal number receive correspondingly less, so that taking the country as a whole the average remuneration to the portion of the 35 per cent. of our population who grow cereal crops must from this source of necessity be very slight.

CONSUMPTION OF WHEAT.

The records show that our population consume from four to seven bushels of wheat per capita each year, depending upon the price, and the condition of the business of the country. The average consumption of wheat, however, taking all of the years between 1871 and 1906, was 5.25 bushels per capita per year. The average production of wheat during that same period was 7.31 bushels per capita, leaving 2.06 bushels as surplus, which is an average of 28.2 per cent. The actual exports for the period from 1871 to 1907 as given in the statistical abstract for 1906 were: From 1871 to 1876, 23.78 per cent. of the crop; 1877 to 1886, 29.94 per cent.; 1887 to 1896, 29.92 per cent.; 1897 to 1906, 28.58 per cent., and the average for the entire period was 28.05 per cent. It will be observed that the average pro rata for export for each period was practically uniform, although the population of the country had increased in that time from 39,555,000 to 84,154,000, or 112.75 per cent.

INCREASED ACREAGE IN WHEAT.

This is due to the fact that the acreage of wheat in the United States as given by the report of the Department of Agriculture in 1906 increased 137.19 per cent., from 19,943,893 acres in 1871, to 47,305,829 acres in 1906, or 24.44 per cent. greater than the population. In other words, it required in 36 years 27,361,936 additional acres to be put out in wheat in order to supply our increasing population and keep up the average per cent. of our export trade.

It is manifest that such an additional acreage cannot be expected in the next 36 years, for the great body of available wheat lands in the United States has been appropriated. The time will therefore come when at the present rate of production per acre our population will overtake our wheat production. As has been shown, wheat production by increasing the acreage each year, has succeeded in holding its relative position as respects population during the past 36 years, the average production per capita varying only slightly in any decade. The average production from 1871 to 1876 was 6.28 bushels per capita; from 1877 to 1886, 8.06 bushels; 1887 to 1896, 7.25 bushels; 1897 to 1906, 7.66 bushels, being a per capita average for the entire period of 7.31 bushels. During the same time the surplus for export has only varied from a minimum average of 23.78 per cent. of the crop in the six years ended 1876, to a maximum of 29.94 per cent. for the decade ended 1886 with an average for the entire period from 1871 to 1906 of 28.05 per cent.

RELATION OF WHEAT PRODUCTS TO GROWTH OF POPULATION.

If the present wheat acreage were to stand still, and the bushels per acre now grown remain constant, allowing 5.25 bushels to the individual per year, and estimating our annual crop at 631,181,626 bushels, which is the average for the past ten years, a population of 120,225,071 would consume our entire production annually. At the present rate of increase this point of complete consumption would be reached inside of 15 years.

Mr. James J. Hill, in an address delivered at the dedication of the Livestock Pavilion on the Minnesota State Fair Grounds, September 3, 1907, presented some figures respecting the increase of our population in the next 40 years that are worthy of serious attention. I quote from his address the portion relating to this point. Mr. Hill says:

> "So careful an observer as Leroy Beaulieu gives the natural increase of our population as 15.2 per thousand per year. It is fair, therefore, to reckon the increase by the excess of births over deaths at 15 per cent. on the average for each decade. The additions by immigration are more variable. It is highly probable, however, that the oncoming tide will increase. Only in periods of severe depression has immigration fallen much below the half million mark for the last twenty-five years. In good or fairly good times it has gone greatly above. In the two years before 1905 it exceeded 800,000 annually, while for each of the last two years it has exceeded one million. It is a conservative estimate, therefore, to add 750,000 a year for increase of population from this source, or 7,500,000 for each decade. Computed on this basis, the population of the United States in the near future will show these totals: Population in 1910, 95,248,895; population in 1920, 117,036,229; population in 1930, 142,091,663; population in 1940, 170,091,663; population in 1950, 204,041,223."

If Mr. Hill's estimate is correct, or even approximately correct, and our population increases by the middle of this century to 204,000,000, we will need 1,071,000,000 bushels of wheat at 5.25 bushels per capita to feed our people. To produce this at 13.5 bushels per acre would require 79,259,185 acres, or 31,953,356 additional acres over that in wheat in 1906, or 67.54 per cent. addition to our present acreage. Can this increase be secured?

DIVERSIFIED FARMING.

It is very clear that the states whose agriculture is now devoted almost exclusively to growing wheat must in the near future follow diversified farming, so that instead of increasing, they will have to restrict the percentage of their wheat area as has been found necessary in all of the Eastern States. This they will be compelled to do in order that the fertility of their soils may be maintained that they may produce sufficient crops to justify their tillage. To put out on any large scale more than one-third of the land adapted to cereal crops in wheat is practically impossible in any system of agriculture that is to continue.

The census of 1900 shows that the per cent. of acres in wheat as compared with the entire cereal crop is at present less than one third. The total land in cereals, barley, buckwheat, corn, oats, rye, wheat, rice and kaffir corn in 1900 in the United States was 184,994,588 acres.

In 1880 the proportion of acreage in wheat to the entire cereal crop was 29.8 per cent.; in 1890, it was 23.9 per cent.; in 1900, it was 28.4 per cent., an average for the three decades of 27.4 per cent., or 6 per cent. less than one-third. This is significant in that this average prevails notwithstanding the fact that the great wheat States of Arizona, California, Colorado, Idaho, Minnesota, Nevada, North Dakota, Oklahoma, Oregon, South Dakota, Utah and Washington had an average of 64.4 per cent. of acreage of cereal crops in wheat. These states have doubtless almost, or altogether, reached their maximum acreage in wheat, and will gradually reduce their area of this crop in future years. Ten states, California, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Nebraska, New Mexico and Wisconsin, have already begun such reduction. In 1880 the percentage of acreage in wheat to the entire cereal crop in these ten states was 45.1. In 1900 this had been reduced to 32 per cent., a difference of 13.1. This same change will undoubtedly occur in all of the other great wheat producing states inside of the next three decades as the ranch system gives place to the smaller farm.

If, however, no reduction occurs and not only the present average of 27.4 per cent. of acreage of cereal crops be put out in wheat, but the area be extended to embrace full 33 1-3 per cent., it would amount to only 61,664,862 acres, or 14,359,033 acres above our present acreage, as reported by the Agricultural Department for 1906.

At the present average rate of production during the last decade, 13.8 bushels per acre, 61,664,862 acres would produce 850,975,095 bushels of wheat per year. This at 5.25 bushels per capita would support 162,090,494 persons, a population which, according to Mr. Hill's estimate, would be reached about 1938, or in 30 years.

PROVISION FOR THE FUTURE.

What are we doing to anticipate this event? We are endeavoring to extend the wheat area by reclaiming waste lands through irrigation and drainage, and the introduction of varieties adapted to districts where the fall of rain is too small to permit of the growth of the varieties hitherto in use. This is practically a continuation of the policy of extending the area in order to meet future demands. That these methods of extension must sooner or later terminate needs no demonstration.

In addition to this somewhat mechanical method there have been established agricultural colleges, agricultural experiment stations and the national and State Departments of Agriculture, together with the farmers' institutes now organized in every State. These institutions have undertaken to deal with the question of the future supply of food products for the increasing population of our country by scientific methods, through the accumulation and dissemination of information respecting the laws of growth, and the discovery of the principles that underlie profitable production. Notwithstanding the efforts of all of these agencies the average production per acre of the various crops has not been materially increased in the last 36 years. The following data taken from the report of the Department of Agriculture for 1906, and from the census of 1900, exhibit this feature:*

Average Production per acre of Five Cereal Crops, 1871 to 1906. Report U. S. Dept. Agriculture, 1906.

Crop.	1871 to 1876.	1877 to 1886.	1887 to 1896.	1897 to 1906.	Average 1871 to 1906.
Wheat,	11.70	12.51	12.66	13.82	12.69
Corn,	26.68	25.06	24.05	25.40	25.30
Rye,	12.00	13.03	12.91	15.94	13.49
Oats,	27.38	27.82	25.51	30.14	27.71
Barley,	21.35	22.41	22.72	25.53	23.00

Average Production per acre of Five Cereal Crops, 1879 ta 1889. Census of 1900.

Crop.	1879.	1889.	1899.	Agr. Dept. Rept.	Difference from Average.
Wheat,	13.0	13.9	12.5	13.1	+.41
Corn,	28.1	29.4	28.1	28.5	+3.20
Rye,	10.8	13.1	12.4	12.1	—1.48
Oats,	25.3	28.6	31.9	28.6	+.89
Barley,	22.0	24.3	26.8	24.4	+1.40

Value of Yield per Acre of Five Cereal Crops, 1871 to 1906. Report of U. S. Dept. Agriculture, 1906.

Crop.	1871 to 1876.	1877 to 1886.	1887 to 1896.	1897 to 1906.	Average 1871 to 1906.
Wheat,	11.78	11.21	8.67	9.48	10.28
Corn,	10.96	9.90	8.58	9.75	9.79
Rye,	9.45	8.16	6.93	8.46	8.25
Oats,	9.56	8.98	7.19	9.85	8.88
Barley,	16.20	13.60	10.40	10.76	12.74

*Note.—Data from both of the above authorities are given in order that the extent of their differences in estimating crop production may be compared.

Value of Yield per acre of Five Cereal Crops, 1879 to 1899. U. S. Census 1879, 1889, 1899.

Crop.	1879.	1889.	1899.	Average.	Difference from Agr. Dept. Rept.
Wheat,	14.40	9.70	7.03	10.37	+.09
Corn,	10.53	8.32	8.73	9.19	—.60
Rye,	7.08	5.54	5.98	6.20	—2.05
Oats,	8.37	6.55	7.35	7.42	—1.46
Barley,	12.95	10.11	9.31	10.79	—1.95

The failure of our institutions to make a perceptible impression upon the increase in bushels per acre is not due to incapacity in dealing with the lines of work in which they are engaged, but in their insufficient number and inadequate equipment and means of support. For instance, in a State like Pennsylvania what can one institution do in the education of six millions of people in agriculture when its efforts are confined to the students in its class rooms and are limited to a few thousand dollars for equipment and employment of instruction force?

KNOWLEDGE OF AGRICULTURE MUST BE GENERAL.

It has been found that to secure an intelligent citizenship education must be general. In like manner to secure an efficient agriculture, accurate information respecting it must be put in possession of the masses of farmers, and not be confined to the fraction of less than one ten thousandeth of 1 per cent. who are able to leave home and attend an agricultural college. The instruction, to be effective in increasing crop production, will have to be extended beyond the college walls to the people out at work, and be fitted for their use.

IMPROVED METHODS OF DISSEMINATION.

If, also, anything like rapid improvement in our agriculture is to be made, it will have to be through a more substantial form of instruction than our present farmers' institutes provide, which meet only a small number of farmers for a day or two each year, and then furnish them only one or two periods of instruction of forty minutes each upon any single topic. If the mass of farmers is to be instructed in the science and mystery of agriculture the information will have to be given in some more effective way than by scattering broadcast bulletins and reports upon agricultural subjects which only the already well-to-do and educated read.

If we are to have a better agriculture, one that will expand and meet the needs of all of the generations yet to come, we must do more than increase superficial acreage; we must make each acre increase its product as the needs of mankind require. In short, we must extend our acres downward.

PRODUCTION PER ACRE.

How far this may be done is illustrated by well-authenticated instances of maximum crop production in the United States. Sixty bushels of wheat have been grown per acre; 71 bushels of barley;

254 bushels of shelled corn; 800 bushels of potatoes; 300 bushels of strawberries, and 12 tons of hay. While these are exceptional harvests, yet they illustrate the productive power of an acre of ground, and show the possibilities of agriculture in these several directions.

PRODUCTION IN FOREIGN COUNTRIES.

What can be done and has been done upon a large scale in crop production by the use of proper methods is illustrated by reports from other countries. The following figures giving the average production of wheat, rye, oats, barley and potatoes in Austria, Belgium, France, Germany, the Netherlands, Sweden, Great Britain and Ireland for the years 1903, 1904 and 1905 compared with the average of these same crops of the United States as given in the census of 1900, show how much further advanced are their methods than those in use in this country. The average of wheat per acre in these eight foreign countries in these years was 28.42 bushels as against 12.5 bushels in the United States; rye, 24.5 as against 12.4; oats, 43.56 as against 31.9; barley, 34.9 as against 26.8; potatoes, 180.23 as against 93 bushels. This shows an average increase per acre in all of these countries above the average production of the United States of 127 per cent. for wheat; 97 per cent. for rye; 35.8 per cent. for oats; 30 per cent. for barley, and 93 per cent. for potatoes.

HOW SIMILAR INCREASE WOULD AFFECT CROPS IN UNITES STATES.

Such an addition to the crops of the United States would be equivalent to an annual increase in value of these five crops over that reported in the Census of 1900 of $666,483,219, or 90 per cent. If the same percentage were applied to the total crop production of that year in the United States, the increase would amount to $2,619,124,726.

If, however, instead of taking the total averages for the three years in all of the foreign countries alluded to, there are selected from them the averages of only the most productive years, a much higher percentage of increase is shown. The following table shows averages of crops per acre in five foreign countries for selected years compared with the averages of the United States in 1899.

Crop.	Great Britain.		Ireland.		Belgium.	
	Year.	Ave. Bu.	Year.	Ave. Bu.	Year.	Ave. Bu.
Wheat,	1905	33.8	1905	37.8	1904	35.1
Oats,	....	....	1905	56.9	1903	63.5
Rye,	....	....	1905	27.0	1903	34.7
Barley,	1905	35.0	1905	46.4	1904	50.7
Potatoes,	1904	234.8	1905	207.2	1904	244.3

Crop.	Netherlands.		Germany.		United States.	
	Year.	Ave. Bu.	Year.	Ave. Bu.	Year.	Ave. Bu.
Wheat,	1904	31.1	....	....	1899	12.5
Oats,	1903	56.3	1903	51.2	1899	31.9
Rye,	....	....	1904	24.9	1899	12.4
Barley,	1903	48.5	1903	36.3	1899	26.8
Potatoes,	1904	240.7	1905	216.7	1899	93.0

If the averages therefore are selected from the most productive years of the seven foreign countries, France, Germany, Great Britain, Ireland, Sweden, Belgium and Netherlands out of the three years, 1903, 1904 and 1905, the increase is applied to the five crops in the United States, wheat, oats, rye, barley and poatoes, as reported in the census of 1900, would represent an additional value of $812,253,344, or 109.86 per cent., and if this percentage is applied to the entire crop production of this country it would amount to an increase of $3,197,078,335 over the reported aggregate yield for that year.

INCREASED PRODUCTION ABROAD DUE TO IMPROVED METHODS OF DISSEMINATION.

This increased average production by foreign countries over the United States is not because of any inherent or naturally superior properties of the soil or climate abroad, but is due to the systematic methods pursued in carrying information respecting improved agricultural operations directly to the farming people.

It is a matter worthy of special note that most of the information given in these countries to farmers is through personal teaching, advice and instruction, and not through bulletins and books. This fact is most significant in that it is a radical departure from the methods pursued in the United States which has thus far depended almost solely in the dissemination of agricultural information upon the printed page, and the slow progress that has been made in agricultural improvement in the United States has no doubt been largely due to the fact that the information that the bulletins, pamphlets and other printed matter contain has not been brought through living, personal teachers directly to the attention of those whom it is specially intended to benefit.

THE IMPORTANCE OF THE LIVING TEACHER.

The movement, therefore, that looks toward the placing of the living teacher in direct contact with the tiller of the soil through the farmers' institute, the movable school of agriculture, and the itinerant advisory professor, as well as the teaching of agricultural subjects to children in the public schools is in the right direction, and is in conformity with the best practice and most successful results secured after many years of experiment in foreign countries.

METHOD IN USE IN IRELAND.

Perhaps as conspicuous an example as any of what this method of instruction may do for a country is seen in Ireland, where in 1905, the average production of wheat was 37.8 bushels per acre, and of potatoes 207 bushels per acre. The following extract from the Sixth Annual Report, 1905-06, of the Department of Agriculture and Technical Instruction for Ireland explains in detail the methods that have been adopted in that country for giving instruction in agriculture. The facts are quoted quite fully in order to show the plans used in introducing improved methods of agriculture into the every-day practice of the great mass of Irish farmers.

ITINERANT INSTRUCTION IN AGRICULTURE IN IRELAND.

'In the year 1905-06 thirty-one County Committees of Agriculture adopted the Department's scheme of itinerant instruction in agriculture, but owing to lack of qualified candidates, only twenty-three instructors were appointed.*

"The main branches of the work of the itinerant instructor in agriculture are the delivery of lectures to farmers at rural centres during the winter months, the carrying out of agricultural experiments and demonstrations, and the visiting of farms for the purpose of giving advice to farmers. During the year under review the instructor delivered 1,169 lectures which were attended by 66,114 persons, the average attendance being about 56. The instructors also superintended the laying down of 2,082 demonstration plots, and instituted 439 experiments on the principal crops. The visits paid to farms reached the total of 8,294, representing an average of 365 for each instructor. As the visits are undertaken only at the request of the farmers concerned, their number affords an index to the place which the instructor fills with reference to the agricultural industry of the county where he is employed. A considerable portion of the instructor's time is occupied in affording advice to farmers by letter, a course which is adopted when a personal inspection of the farm is unnecessary or not feasible at the moment."

ITINERANT INSTRUCTION IN HORTICULTURE AND BEE-KEEPING.

Twenty-six itinerant instructors were employed by the County Committees in giving instruction in horticulture and bee-keeping.

In each of ten counties the instructor was qualified in horticulture as well as in bee-keeping; in eleven counties the instructors were not qualified in bee-keeping, and gave instruction in horticulture only; in each of four counties two instructors were employed, one being qualified in horticulture only, and one in bee-keeping only; and in one county an instructor in bee-keeping only was available.

The lectures, as in the case of other schemes of itinerant instruction, are usually arranged for the evening, when such subjects as soils, manures, vegetables, fruit and flower cultivation, plant diseases and insect pests are dealt with. The demonstrations are held either at the established plots or in the gardens and orchards, in the districts visited by the instructors, and on these occasions practical lessons are given in pruning, spraying, planting and grafting of fruit trees, vegetable culture, modern bee-keeping, etc.

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*There are 32 counties in Ireland.

During the year ended June 30, 1906, 624 lectures were delivered with an average attendance of 57, and 14,994 visits and demonstrations were given.

The establishment of several horticultural demonstration plots throughout a county as examples of proper methods of selection and cultivation of fruits, vegetables and flowers, is regarded as a feature of great educational value in the scheme. At each plot (which it is recommended should not exceed a quarter of an acre in extent) it is usual to plant apple, pear and plum trees, as well as gooseberry and current bushes. Raspberries and strawberries are also planted, and the remainder of the plot is utilized for growing vegetables, herbs and flowers. The planting is done under the supervision of the instructor who periodically visits the plot for the purpose of directing its cultivation and conducting demonstrations. In all 108 plots of this kind were established.

The section of the scheme which is most generally appreciated is that of regulating the purchase by County Comissioners of trees in bulk, and the reselling of same at cost price to residents in the counties. Every care is taken to ensure that the trees so distributed are of good quality and free from disease. The Department's horticultural overseer in the first instance inspects the nurseries from which the Committees decide to obtain their supplies, and the advice of the county instructor is afterwards available for the purchasers.

From weekly returns furnished by the instructors, it appears that during the twelve months ended 30th September, 1906, the following varieties and quantities of trees were planted as a direct result of the operation of the scheme:

Apples	33,172
Pears	1,519
Plums	2,475
Damsons	143
Cherries	122
Gooseberries	12,457
Currants	5,233
Raspberries	5,447
Other fruits	7,091
Other trees	158,907

ITINERANT INSTRUCTION IN POULTRY-KEEPING.

Twenty-nine itinerant instructors were employed during the year and their duties as in previous years included the delivery of lectures on poultry-keeping, visiting poultry runs, and giving practical advice to poultry keepers, conducting classes on the fattening, killing, plucking, trussing and preparation of fowl for market, and on the grading, testing and packing of eggs. These classes were conducted on a more extensive scale than previously, and were of a practical nature.

The following is a summary of the work of the instructors in months ended September 30, 1906:

Number of lectures, 2,024; average attendance, 67; number of classes, 629; average attendance, 14; visits (fowl runs), 10,656.

The egg stations, from which settings of eggs of pure-bred hens and ducks were distributed at a nominal charge to residents in the counties in which the scheme operated, were largely availed of during the season extending from the first of December to the 31st of May.

The following is a summary of the number of egg-distribution and turkey stations established in each county during the year 1905-06, and the number of settings of eggs distributed: Number of egg-distributing stations, 495; settings of eggs distributed (hen), 45,726; (duck), 6,683; turkey stations, 404.

It may be interesting to mention the extent to which a demand existed for the various breeds kept at the stations, and, accordingly, the following table has been prepared, showing the number of settings of eggs from each breed sold under the scheme:

Minorcas	5,584
White Leghorn	9,937
Brown Leghorn	4,095
Orpington	8,894
Plymouth Rock	6,136
White Wyandotte	4,091
Favorolle	5,988
Houdan	1,063
Indian Runner Ducks	5,443
Aylesbury Ducks	1,176

The following table shows the progress of this scheme since 1900:

Year.	Counties.	No. of meetings held.	No. of Egg Distribution Stations.		Egg Distributed.	No. of turkey stations.
			Hens only.	Hens & Ducks.	Dozens.	
1900-1,	4	223	.....	.....	.....	.....
1901-2,	12	1,134	36	.....	4,108	.....
1902-3,	22	2,231	220	.....	18,040	.....
1903-4,	32	3,185	346	46	40,857	181
1904-5,	30	2,662	333	129	49,181	328
1905-6,	30	2,024	315	180	52,409	414

ITINERANT INSTRUCTION IN BUTTER-MAKING.

Twenty-eight instructors were employed in twenty-four counties during the year 1905-06 in connection with the operations of the scheme of instruction in butter-making.

The practical instruction given at the meetings held at local centres has been greatly appreciated, and the demand for instruction of this nature continues to increase.

The following is a summary of the operations of the scheme during the year: Number of lectures, 328; number of daily classes of from two to four weeks' duration at each centre, 3,232 (the average attendance being nine pupils). In addition 2,477 visits of inspection were made to private dairies."

The following statement shows the number of counties in which instructors have been employed each year since the inception of the scheme:

Year.	Counties at work.
1900-1	1
1901-2	4
1902-3	11
1903-4	18
1904-5	22
1905-6	24

This report ought to be of service to those of our people in the United States who are endeavoring to secure a better agriculture for her citizens. It points the way to increased and more profitable production. It has brought the wheat crop of Ireland to 37.8 bushels per acre, rye to 27, barley to 46, oats to 57, and potatoes to 207, not to speak of the fruit, dairy and poultry industries which have all in like manner been greatly advanced.

GOVERNMENT AID.

In Ireland and in the other foreign countries work of this character is undertaken by the Government. In some countries it is conducted almost wholly under central governmental auspices. In others it is in cooperation with provincial Governments and local societies, but in every case the introduction of the system has been through central governmental initiative and control, as in England, France, Germany, Italy and other European countries, with uniformly highly beneficial results, as the agricultural production of these countries demonstrates.

In the United States we have depended largely for the dissemination of agricultural information upon bulletins and the columns of the public press. While these agencies are absolutely essential they of themselves are comparatively helpless to secure such changes as are needed in the practice of the individual farmer whose education has been limited, and whose opportunities for observation have been few.

When it is remembered that 94 per cent. of the population of the United States are restricted in their education to that given by the common schools it is little wonder that agricultural knowledge among rural people is limited largely to traditional methods. If agriculture is to be improved it is absolutely necessary that this great body of workers, 94 per cent. of our population, shall have the advantage of the discoveries of modern science along the lines of increasing production, and it is becoming very clear that there is no way by which this can be so rapidly and economically effected as through the sending of expert teachers to instruct them by meeting them at their homes. The experience of every European country has confirmed this view, and their practice for many years has been chiefly confined to this method of imparting information with the remarkable results to which attention has been called.

While this work is properly that of the several States both as to its control and operation, and would finally be lodged with them, yet in order to introduce the system and show its practicability and adapt it to the conditions which prevail in the United States, much time would be gained and many mistakes avoided if the

National Government should first make an investigation of the entire field which the system is to cover. For this a corps of expert investigators could be employed to devote their entire time to the discovery and perfecting of a system suitable for use by the agricultural educational institutions of the country, in order that all of these agencies might avail themselves of the latest and best methods for teaching agricultural subjects both to classes in school and college, but most important of all, to the mass of people who can never go to the higher industrial institutions of learning. A similar body of experts could likewise be employed to go into the several States upon invitation of the proper local authorities to demonstrate as teachers the value of the methods desired to be introduced.

DISTRIBUTION OF INFORMATION, THE GREAT NEED OF AGRICULTURE.

There is just now a great accumulation of agricultural information stored in books, bulletins, offices and in department bureaus and reports. Like a bountiful supply of water in a reservoir, there is needed before it can be of service, distributing mains and pipes to lead it into the homes of the people who need it for daily use. Distribution of information is the most crying need in agriculture to-day; greater than investigation, research or higher education, necessary as these all are.

The several states and the National Government which established the Land Grant Colleges for instruction in agriculture and the mechanic arts, and the agricultural experiment stations for research, cannot afford to neglect to provide that the results which these institutions have discovered and will continue to discover are disseminated and put to use as rapidly as possible, and not remain unutilized for lack of conveyance to the homes and into the practice of people.

Congress by the Land Grant Act of 1862 and by its several supplements provided for higher education in agriculture, and by the Act of 1887 establishing the experiment and research stations, made provision for the discovery of new truth in agricultural science and practice. It now remains for Congress and the several States who accepted the provisions of these several Grants to complete their work in industrial education by providing for the proper distribution of the truths discovered among those who from lack of money, previous educational advantages, or because of family ties and duties are unable to go to college or to understand and intelligently apply the methods which the scientific institutions of the country have discovered as adapted to their use.

The necessity for such distribution just now in this country needs no argument to prove. It is manifest on every side, and is voiced by every intelligent farmer and by every industrial educational institution in the land. The practicability of the methods proposed for instructing agricultural people has been demonstrated through a long period and on an extended scale by every European country until there is no longer any room for doubt in this respect, and the great value of these methods to the country is manifest from a comparison of the agriculture of the United States with that of those countries that have adopted the form of distribution which employs the itinerant school, the advisory instructor, and the demonstration farm and field in the dissemination of agricultural truth.

REPORT OF THE CHEMIST.

BY DR. WILLIAM FREAR, *State College, Pa.*

The subject of paints, their purity and durability, possesses especial interest to the farmer because he uses far more paint than the average citizen, and because for his uses paints of high durability are especially needed, since they are required chiefly for application to the exterior of dwellings, barn buildings, fences and implements. The experience of recent years and vague information that has drifted through the community, have led many to the belief that the paints and related materials on sale in American markets are often far below standard in composition, durability and other important properties.

In order that the subject may be clearly understood, let us consider briefly the essential characters of oil paints, the only kind of paints important in this relation. Oil paints consist essentially of two materials, a solid pigment and a liquid part. The liquid part is primarily composed of one or more drying oils. For the cheaper paints used in coating the outside of buildings, linseed oil is the only drying oil largely employed, while for artists' purposes, other oils, such as walnut oil, are used.

The value of the drying oils for this purpose is due to their property of drying when exposed in a thin layer to the air. When thus exposed, the thin oil film rapidly takes up oxygen from the air and forms a substance, varnish, which is both hard and tough; that is, is not easily cracked or pulverized by exposure to varying temperatures, vibration or light blows.

Experience shows, however, that when a hard oil finish on wood is exposed to rain or sunshine, it rapidly loses its gloss and disintegrates; hence such a finish prepared from linseed oil alone is not sufficiently durable for an outside coating of wood structures.

It has, however, long been known that if certain pigments be thoroughly incorporated with the drying oil, a thin layer of paint thus prepared, dries rapidly and forms a glossy, tough coat, which is much more durable when exposed to the weather, protects properly seasoned wood from decay, and at the same time, because of the variety of color that can be secured by the use of different pigments, makes possible the use of paint for a much wider range of decorative effect.

It may be noted in passing that even the most durable paints are not absolutely impervious to moisture, but that damp air will pass slowly through them to or out from the wood they cover. They do, however, prevent wood in contact with the air from absorbing large amounts of water, and also from contact with a great variety of organisms that tend to produce decay. In some cases, too, the pigments are poisonous to such organisms and might serve in part to arrest decay already started.

In addition to durability, a good paint should possess body; that is, the power to conceal thoroughly underlying layers to which the paint coat is applied; and also covering power; that is, the property of being capable of spreading uniformly from a brush over a large surface.

Oft-times the painter desires to increase the covering or spreading quality of a paint, and for that purpose mixes with the paint volatile liquids known as thinners, which rapidly evaporate from the thin layer of the paint-coat leaving the drying oil exposed to the air. It is probable that the formation of varnish from the drying oil is not so simple a chemical process when the oil is thoroughly mixed with certain pigments; such, for example, as white lead. Experience shows further that where thinners are employed, the physical quality of the paint coat is not so good, that is, not so tough, durable and glossy as where the oil hardens in the absence of thinners. The principal thinning agent which is in use by painters upon first-class jobs is spirit of turpentine, and even this thinner must not be employed in too large proportion.

Prominent adulterants of the liquid portion of paints are semi-drying and non-drying oils such as corn or maize oil and cottonseed oil, which are used as partial substitutes for linseed oil, and largely diminish its varnish-forming power. Benzine from petroleum and water are the other principal adulterants of the liquid portion of oil paints. Benzine is used as a thinner, being a substitute for spirits of turpentine. It volatilizes more rapidly than the turpentine and leaves a fair inferior coating. Benzine is much cheaper than spirits of turpentine, and water is simply a make-weight which seriously reduces the gloss and life of the paint coating. Water has the quality of giving to mixtures of some pigments, such as white lead, and linseed oil, the appearance of a thicker consistence, sometimes termed "a livery condition." Paints in this condition do not spread uniformly from the brush.

One other ingredient sometimes used in the liquid portion of the ready-mixed paints is what is called a drier. For this purpose either boiled oil or a japan is used. Both of these preparations are made by heating linseed oil in contact with oxid of lead (litharge) or other metallic compound. In these processes the liquid takes up a little of the metal which seems to act as a carrier of oxygen, so that these driers possess, under certain conditions of use, the property of forming varnish very rapidly, and when mixed with an oil compound, of securing a rapid drying and hardening of the coating which is often desirable in painting exterior surfaces in showery weather, or the interiors of rooms that must be quickly prepared for use. It is generally known, however, that excessive use of driers is not advantageous and that where used in any considerable quantity, the paint coat suffers in gloss and durability.

It would be impossible in this brief paper to discuss in detail the numerous pigments employed in the manufacture of paints. In order that the paints may have both body and a large covering power, it is clear that the pigments must be distributed through the paint in a very finely divided condition. This is generally secured by grinding them in oil as the final step in the process of manufacture. With the exception of reds and yellows, the principal paints used for the exterior of dwellings, barns, etc., are made by mixing a large proportion of a white paint and a small quantity of some highly colored paint or paints, thus producing the delicate shades of color preferred for decorative purposes. It is clear, therefore, that so far at least as paints for wooden structures are concerned, the white paints used as the bases for the various paints are most important. Attention will therefore be confined chiefly to them. The best known and most widely accepted white pigments for making oil paints are Dutch-process white lead (a hydrated lead carbonate) and zinc white, which is composed chiefly of zinc oxid. The white lead is very heavy, flows very evenly from the brush and has a very good body. However, it turns yellow to black when exposed to air containing sulfurretted hydrogen. It is sold either dry or mixed with about 9 per cent. of raw oil. The so-called pulp white leads contain considerable water, while they are said to flow even better than the pure lead and oil mixture, but have disadvantages as were above mentioned. Sublimed white lead is quite different chemically from ordinary white lead, imparts high body to the paint, is probably equal to the Dutch-process lead in covering power and wearing quality, and besides does not blacken like the latter. Zinc white, Chinese white, is lighter in weight than either Dutch-process or sublimed white lead, is very permanent in color, possesses a somewhat bluish tinge rather than the dreamy white of the above mentioned lead pigments, but requires more than twice as much linseed meal as they do to prepare a satisfactory "still paste," that is, the mixture of oil and pigment sold in bulk for painters' use and requiring further admixtures of oil before the paint is ready for application. Zinc white has a better covering power than white lead, but is very deficient in body, so that it is very commonly mixed with other materials to correct this deficiency.

Other white materials are very frequently substituted for the high-grade pigments above mentioned. Among these may be mentioned lithophone, a mixture of barium sulfate, zinc sulfate and zinc oxid. This is sometimes called sulfite of zinc white, another similar pigment is Charlton white. These materials are non-poisonous, do not discolor easily except when mixed with lead or copper pigments, and have excellent body. Their own color is, however, not uniform. At present they are employed chiefly for inside use. Barium sulfate, commonly sold as barytes or blanc-fixe, is very heavy and of low covering power; that is, has little body, does not work well in oil, works out streaky from the brush and dries very slowly. Calcium carbonate sold as Paris white, English white, whiting, etc., is a dull white powder which turns dirty grey when mixed with oil, and requires a large amount of oil to make a paste. Putty is simply a mixture of whiting with 18 per cent. of linseed oil.

Calcium sulfate, mineral white, is rather transparent when mixed with oil, but has a high covering power.

White clay, China clay, has little body when mixed in oil. The same is true of silver white, silex or silicia.

Speaking of the pigments other than white lead and zinc white, Sabin, an authority on paints and varnishes, says of these, the "barium paints are the least objectionable, being in fact substances chemically inert and of suitable composition; but they are practically without covering power, being nearly transparent in oil, and while they probably help to protect the wood, they are really used only to cheapen the paint, and commonly to increase the profit of the maker or dealer; not at all for a benefit to the consumer."

The attention of the writer was attracted to this subject when he received for analysis, some months ago, several samples of ready mixed paint advertised for farm use. One of these samples, a white paint, contained about one-third by weight of liquid material composed of oil and a large fraction of benzine. Two-thirds of the weight was a white pigment of which only one-half was made up of high-grade materials, white lead and zinc oxid, the rest being composed of barium sulfate, calcium carbonate and a little clay. The mixed paint, it was recommended, should be mixed before using with an equal volume of linseed oil, a low grade of this oil being furnished by the makers of the paint. This mixture, when prepared according to directions, was very thin, and, upon test by a practical painter, was pronounced "very poor."

A second sample was a red paint of very fluid consistence. The liquid portion, amounting to about 40 per cent. contained both water and benzine. The pigment contained less than 2 per cent. of red lead and about 10 per cent. of Venetian red (lion oxid). Over three-fourths of the total weight of the pigment was composed of chalk, barytes and clay. This mixture too was pronounced very inferior upon test by a practical painter. However inferior barytes, whiting and China clay may be as pigments for imparting a glossy, durable coating to a smooth-finished wood surface, it is only fair to remember that not all wooden surfaces are of this character, and that coarser-grained pigments are sometimes desirable for "filling" rough surfaces. Thus, the Pennsylvania Railroad Company in its specifications for freight-car color, specifies that the pigment shall consist of iron oxid, 50 per cent.; gypsum, 45 per cent.; and calcium carbonate, 45 per cent.; but prohibits the use of barytes or dehydrated gypsum which has less body than the fully hydrated substance.

Notwithstanding the facts just mentioned, close study of the analytical data shows that these paints were very inferior articles, unfitted for application to a surface of good finish and for giving an opaque, glossy, durable coating.

A very important work in the study of paints has been performed by the North Dakota Experiment Station.

As a result of the analysis of nineteen samples of paints sold as white lead, four were found to be true to name, one, a mixture of white lead and zinc oxid, and the remaining fourteen to contain large admixtures of barytes, chalk, clay, etc.; in other words, only about one-fifth of the samples were true to name; and these samples it should be noted, represented most of the brands of white lead on sale in North Dakota markets.

An examination further of white mixed paints and of light tinted paints with a white base, comprising ninety-one samples representing about as many brands, showed but one instance in which white lead was used as the sole base, five in which zinc oxid was so employed, twenty-five in which various mixtures of these two ingredients constituted the base, and sixty cases, or two-thirds of the entire number, in which bartyes, chalk, and other adulterants were employed. The liquid portions of these paints contained benzine in thirty cases, sometimes large quantities of it; and in twenty-eight cases, water in quantities ranging from 8.25 per cent. was present. In general, it appeared that if one were purchasing white lead, there was about one chance in five of his getting what he asked for, and if he would buy the white or tinted paint, there was only one chance in three that he would get an article of good quality. It was true almost without exception that where benzine was used as a drier, water had also been added in large quantity.

So far as examinations have been made in other localities, they indicate that fraud in the paint trade is equally predominant. Consequently, the last two or three years have witnessed a very widespread movement to correct this evil. North Dakota passed the first pure paint law, and required that all paints except those made of pure white lead, zinc white, linseed oil and turpentine or japan drier, must have upon their labels a true copy of the formula followed in their manufacture. All packages were further required to bear a statement of the net weight of the paint contained. This law has been attacked as unconstitutional, but the United States courts have affirmed the constitutionality of the Act. There is at present pending before Congress, a National Paint Bill. The New York Legislature is likewise considering a pure paint bill, and a number of other states have either passed such laws, or are agitating their passage. The subject is one that merits the attention of Pennsylvania buyers of paints.

It is true that our linseed oil sold as such is already tested by the State, but such testing becomes of less importance as the trade in ready-mixed paints increases in volume, and these paints are shown by the investigations above mentioned to require, far more than linseed oil, the control of some properly authorized public agency.

REPORT OF MICROSCOPIST AND HYGIENIST. No. 1.

By Prof. C. B. Cochran, *West Chester, Pa.*

I want to begin my talk by calling attention to one or two samples which I have brought with me and placed on the table. This one is a sample of honey dew, from chestnut leaves. The other is poplar honey. I thought this honey dew might be interesting to you. It was brought to me by an apairist living about eight miles from my home at West Chester. I have made three analyses of the article, and find it closely resembles ordinary honey extracted from flowers and plants. It has the same chemical analysis.

The topic on which I want to talk to you this evening is Coal Tar Colors in our foods. These are exceedingly numerous substances. There are over two thousand of them quoted. I have in my laboratory about two hundred and fifty of these colors, and during the past year I have made a very careful analysis of about two hundred of them. As a witness on the stand, I am often asked do I find coal tar there. Lawyers often confuse coal tar color with coal tar. Now, they might just as well ask if we find any potatoes in Irish whiskey, which is made from potatoes, as to ask if we find coal tar in coal tar colors, because coal tar bears no more resemblance to it than it does to the air and soil from which it is derived. Coal tar is a large subject, and if you will bear with me just a moment, I will call attention to just a few of the products derived from coal tar, in a general way.

If we put coal tar in a retort, and subject it to heat, there results from this distillation an ammoniacal article, the water of which contains considerable ammonia. Then there comes a substance which is known as Carbolic Acid Phenol. A little later come the heavier oils, and then the solid, as you see in that bottle, known as Naphthaline; from it is derived the Moth Tar Marbles, sometimes called Tar Camphor. There is one component that is white; it is known as anthracine; the other products leave the retort as what is known as Coal Tar Pitch, a product which is a hard, solid, brittle black mass. This is mixed with some of the products of coal tar and makes a roofing paint, and the difference between it and coal tar is that some of the water which causes it to absorb in the timbers has been removed.

Now, we start in to get coal tar colors. Here is one of the colors, a red coal tar color, which is often found mixed with the gluten feeds. As I have said, they are exceedingly numerous, and are all colors and shades of colors, so that nearly every colored article of wearing apparel is colored with one of these coal tar products. They have taken the place completely of the vegetable and animal colors.

Now, as to the use of coal tar colors in foods. Many of our foods have no color, and sometimes, when they have, the color is not so decided as we would like to have it, therefore the color is made by the addition of a little coal tar color that will give a similar hue to the article, but of greater intensity than the article would naturally have. Just a few of these I have brought with me, and want to show you. Here is one sheet on which there are some pieces of wool which were white, but which were colored with coal tar colors that have been extracted from food substances. The first one to my extreme left was extracted from cranberry sauce. It seems that in this particular instance the cranberry sauce did not have as high a color as they wanted it to have, so they colored it with coal tar products, and a little of that color dyed into this piece of wool, is what you have right here.

You know that in the markets of the State are bakers' supply houses, where bakers can go and obtain almost any thing they want. A sample of huckleberry pie filler was taken from one of these bakers' supply houses, and here is a piece of wool dyed with the coal tar color which was extracted from a small amount of huckleberry pie filler. Huckleberries are usually of a very dark color, and they should have color enough in themselves, but in this particular instance, it appears they lacked the necessary color, and it was supplied by coal tar dye.

The next one that I want to call your attention to is a plum pie filler, the coloring matter of which was made from coal tar color, and the sample to my right is a piece of wool dyed with a small quantity of the color extracted from currant jelly. The piece of wool was originally white. Now, red currants have usually enough color, but in this case the color was supplied by the introduction of coal tar color.

Here is a sheet containing a number of coal tar colors which have been dyed into pieces of white yarn. These are all coal tar colors that have been derived from various samples of Port wine. Port wine is the product of the grape, but in these particular samples, the port wine from the grapes did not have a high enough color, and consequently the color is obtained by putting in the coal tar color, and making it a brighter red, and more nearly the color desired.

Meats of all kinds and descriptions are also colored with different coal tar colors. Here is a piece colored from a coal tar color called a "Blood Red," and used in a Chicago packing house to color and preserve meat. It contains a mixture of salt, saltpetre and boric acid, and is colored by a coal tar color. This was obtained direct from a Chicago packing house.

Here is a color, a coal tar color, used in coloring smoked meats, and called Ceylon Cola. It is a very dark red, and is very highly advertised as a coloring matter and preservative for meat, and as a substitute for smoke. I was considerably amused at one of the uses for which this coloring was advertised. It was as a preservative of fence posts, by dipping the posts in the color. I suppose that the persons who recommended it knew that dipping the posts into tar was a preservative of them, and thought the coal tar coloring would have the same effect as the tar. You might just as soon expect to get the same effect from whiskey as from rye.

The sheet that I showed you a moment ago contained reds taken from Port wine. These reds are the return from Blackberry brandy. Of course, we all know that the term "brandy" is somewhat of a misnomer; it is not properly a brandy. But we should suppose that the dark color of the blackberry would be sufficient to color the brandy properly, but in this case it does not appear to have been so, because its dark color is due to coal tar dyes. There are different colors that can be used, and that were used to give this brandy the proper color.

Tomatoes are red usually, sometimes yellow, but we should at least suppose that there would be enough color in red tomatoes to color the tomato catsup without being compelled to resort to coal tar colors, but here are eight samples of wool, all of which have been dyed with coal tar colors derived from eight different brands of tomato catsup. The color was made bright enough to appeal to the customer by the use of coal tar color.

You know that at some seasons of the year, particularly in winter, the hens produce eggs, the yellow of which is not a very bright color. Now, when you use these eggs in making a cake, you can't get a rich color, and to offset that, there has been put on the market an egg color in coal tar colors. It is used in cakes by bakers to get the color of the egg. These colors here do not show very well by artificial light. This is a yellow, and this is a red orange, and the two mixed will produce a bright yellow color, show very well by artificial light. The same thing that is true of eggs, holds true of cheese. Many of the cheeses on the market are made up with coal tar color.

Here is a piece of wool that was dyed with the color derived from a blood orange that had none of the red blood in it. It was put there by coal tar color. The same thing is true of the pretty orange color of the soda water you buy; here is a piece of wool dyed with the coal tar color taken from blood orange soda water. This is another dyed from a sample of the orange juice taken from the boardwalk at Atlantic City. The same thing holds true regarding butter. Where the butter is lacking in the desired color, you can use the coal tar colors, and make it have the appearance of a good, rich butter, supplying the natural color that is lacking.

Now, I have been looking at these things from the standpoint of the food chemist. You may perhaps say, why, if the use of coal tar colors improves the color of the butter, or the color of our food articles, why may we not use it, if the article contains just as much pure food? If the food is good, but lacking in color, why not introduce the coloring matter that will give it a better and more natural appearance? It can be used all along the line as an improving agency, but while it is used in that way, in nearly every one of the samples which I have shown you thus far, the coal tar color was not used to improve the article, but to color it. Why was the coal tar color used in cranberry sauce? Not, as I said a moment ago, because the cranberries were lacking in color, but because the cranberries were not there. And here in this huckleberry pie filler the same thing holds true. The huckleberries were not there, possibly one or two dried berries slipped in to give it the flavor. You would imagine that huckleberries were cheap enough to be used in this filler, but their color was cheaper, so they made up a filler, and colored it with coal tar color. So in regard to the Port wine products, and the blackberry brandies. They are original products in every sense of the word. Coal tar products are used to give them the appearance of the natural article, which is not there at all. I recollect one sample of Red Raspberry Jam, put up by a firm in Baltimore, the name of the firm given on the label, and sold under the title of "Highland Brand Raspberry Jam," highly recommended as absolutely pure, and entirely wholesome. Now, what did I find there? It was chiefly glucose, filled in with a little apple juice colored with the coal tar color. It was not quite sweet enough, so a little saccharine was used—by the way, another coal tar product, used sometimes as a stomachic in Diabetes. Salycilic acid was used as a preservative, and to give the appearance of raspberries, alfalfa seeds were used.

Now, in regard to the wholesomeness of these coal tar products.—perhaps I had better say just how they are used. Here is a sample of Strawberry Cream Candy; I took a small sample of that candy, weighed it, extracted the color from it, and dyed it into this piece of wool. I then figured from this basis how much of this Nun's Veiling the coloring matter of one pound of this candy would color, and it is a matter of memory with me now, but I think I can trust my memory in this—I think it is eight square yards of Nun's

Veiling could be colored with the coloring matter of one pound of that candy. This should give you an idea of the extent to which this coal tar coloring is used. If it were not for the question of these coal tar colors, the pure food question would be much more simple than it is. Any ordinary adulteration could be detected, but it is not so easy to detect and overcome the insiduousness of the coal tar colors.

Now a word as to their wholesomeness. About fifty years ago the use of coal tar coloring was discovered accidentally by Sir William Perkins. The anniversary was celebrated with a great deal of pomp in this country last year; he was here as the guest of honor. I mention this to show you the regard to which most chemists hold it. Nothing is known of the physical action of these products on the human system. Most of them are supposed to be injurious to health. Some have been proven to be positively injurious to health, while others have been proven to be almost inocuous. The great majority we know nothing about. Some of them are poisonous, but are used in food products. For instance, we have butter color. There are two coal tar products used to color butter. We have one that is not soluble in water, but is soluble in oil, and one that is so poisonous that a teaspoonful will produce death in an adult. Then there is another one that is known as "Marsh's Yellow" that has been used very extensively. We have found it frequently used in mustard, in what is known to the trade as Durham's Mustard, made up of wheat flower, a little cayenne pepper, and colored yellow. You can make about 75 per cent. on it, and put it on the market as "mustard." Marsh's Yellow is one of the poisonous products of coal tar.

I know there was a lengthy program, so I came prepared only to give a very short talk, and it occurred to me that you might be interested in the use of coal tar colorings in our foods—a subject which has interested me very much. I feel that in the use of coal tar coloring we have made an opening that we hardly know where it will end. It is used first in one article, then in another, and then in another, until, from my standpoint, I hardly know where to draw the line.

REPORT OF MICROSCOPIST AND HYGIENIST. NO. 2.

CHEMICAL CLEANLINESS.

BY PROF. G. G. GROFF, *Lewisburg, Pa.*

What can the Hygienist think of except the preservation of health, and the increase of human happiness? How can the teacher aid in the dispersal of knowledge outside his classroom? The Good Book says "The people perish for lack of knowledge." And, yet, within a few weeks, two leading citizens of a foremost county in our own State, have expressed themselves to the effect that no great amount of learning is needed to make good farmers. There are others, also, who hold the same idea, for those destined for many divers occupations.

This summer in Western Massachusetts, I ate the best butter I have had for a long time. At home I often have great difficulty in buying good creamery butter. It generally has a taste not pleasant to me or my family. In Massachusetts, my brother told me, there were State inspections of both dairies and creameries, and that certain requirements were insisted upon as to cleanliness. The result is shown in the Massachusetts butter, while we have little required inspection of dairies or creameries in this State, and we have a whole lot of very poor butter.

There are all degrees of cleanliness, as well as of dirtiness. My thought is that most people mean to be clean, but do not know how. Thus, most people believe that soap and water will cleanse the hands, but these will not nearly do it. Soap, warm water and a nail brush, used each time before and after milking, will not sufficiently cleanse the hands, so that absolutely pure milk and butter may be produced. No surgeon, worthy of the name, would to-day perform a serious operation without using water, soap, a nail brush, and some chemical, or more than one chemical, to cleanse his hands, and many surgeons, despairing of getting the hands clean, now uniformly operate wearing gloves, which have been boiled, baked or soaked in chemicals, or otherwise made chemically clean.

It is largely because the hands are not clean that milk spoils for the dairyman and is returned to him by the dealer. It is because the buckets, pans and cans are not chemically clean, that other milk spoils. Still other milk is spoiled because the room and the vessels at the creamery are not chemically clean. A little hot water and a dirty cloth will never ceanse dairy utensils as they should be cleansed. Much hot water is needed even to wash a few vessels, and these should then be rinsed in scalding water, or better, steamed, and then exposed to fresh air and sunlight as long as possible before being used again. The dealers in the city should be required to wash and steam the milk cans before returning them to the farm.

It is because the hands of the nurse are not chemically clean that typhoid fever and other diseases are spread through the household where they have once gained admission. A physician with dirty hands is a very dangerous person to admit to your home, for he handles all manner of diseases; but to the credit of the profession, they now generally know the importance of clean hands and clean clothes.

Another hard place to convince the people of the importance of chemical cleanliness is in relation to the drinking water. Almost every farmer will get angry if you say his drinking water is impure, yet very many farm wells and springs and most small streams of the farm are polluted to the extent that they may almost at any time cause trouble in the family. Now, drinking water, life Caesar's wife, should always be above suspicion. It can only be kept so through eternal vigilance. Water that contains the least trace of sewage or of human waste is absolutely unfit for human ingestion until it has been purified. Some other peoples seem to know this better than we do. The Chinese drink only boiled water or tea (water chemically purified) while many Europeans drink only weak wines or beers, water chemically purified by a small amount of alcohol.

The rat and the mouse are dirty animals and make human food dirty. We often make war against them, but because they destroy food, not because they defile it. Instinctively we detect these animals, and it is well, for besides making foul our food, they are possible disseminators of disease. Both rats and mice, some species more than others, suffer from something very like cancer, a disease becoming more alarmingly prevalent, and it is well known in Eastern countries that the rat suffers from the Oriental plague. Would it not be well to have one or two days each year in which to thoroughly hunt out and to destroy rats and mice, on the score of cleanliness?

The housefly is a fearfully dirty creature, and there can be no cleanness where it exists. People have long regarded it as a pest because of its numbers and its dirty habits, but we should look upon its dirty feet and dirty mouth as the means of the dangerous pollution of every house in the land. We have been trying to fight it in the wrong manner, i. e., screening it out of our houses. The place to fight it is in the breeding places. Screen the horse stables and the manure pit, and the fly will very sensibly diminish in numbers. Porto Rico is an island of perpetual summer, and yet without houseflies. Go there and learn how to control them. We read in the Good Book that they were sent into Egypt as a punishment upon the Rulers. Why do we have them?

House dust and dust of cities are both unclean and dangerous. In the house, dust consists of particles of the human body, of clothing, of the carpets, and of the ashes from the stove or furnace. Ashes have been purified by fire, and are only unsightly. The others are dangerous. In towns, the dust of the streets consists largely of human and animal waste, all unwholesome, and often disease-bearing. Think of the fruits and berries exposed to the dust of the streets, hour after hour until sold!

I have been addressing farmers. Far be it from me to say or even think that they or their families are in these matters sinners above others. I do not believe for one moment the statement that we often see, that the country furnishes disease and death for the city. I, on the contrary, after an experience of over twenty years as a health officer, fully believe that, correctly examined, statistics will show that disease of all kinds abounds most where people are most gathered into masses, and where they are most ignorant. These are not the conditions on the farm. My experience has been that it is the cities and larger towns which are the breeding places of smallpox, typhoid fever, diphtheria, scarlet fever, etc., and when we find these diseases out in the country, we have only to hunt long enough and we will be able to trace them to some city, large or small. Indeed, the time has come when this Board should ask for protection against city-bred diseases.

In the struggle after absolute cleanliness, it is well to let Nature come to our aid. She cleanses through the use of sunlight and fresh air. Where air and sunlight can freely enter, the sanitary inspector finds but little to recommend. Too often disinfectants are of no value because ignorantly used. Too often they only cover up one bad odor by another almost as bad. Forcing a little gas through a keyhole into an infected room is worse than useless. It is dishonest, for it offers safety where there is none, and it is giving a stone where bread has been asked. Besides sunlight and air, fire applied directly, or by means of baking infected objects, or by steam or boiling water, and numerous chemicals, are absolute disinfectants.

It is not desired to convey the idea that specific diseases (using the word in its general sense) will be produced by uncleanliness, but a general lowering of the bodily strength will surely be brought about by a disregard to cleanliness of food and drink, and in this lowered condition, disease easily overcomes the body. The dirt most to be feared is the waste from our own bodies. To each class of animals, its own excreta of every kind, i. e., waste of skin, lungs, bowels, kidneys, is deadly poison. Free elimination is demanded for this waste as it is formed; in no other way can the highest health be maintained. The dirt which lurks in dark, damp corners is the kind to fear. Indeed, the trio, dirt, darkness and dampness, invite the presence of another feared trio, disease, death and the Devil.

I have talked plainly about some unpleasant and unpalatable truths. I fully believe that far more harm to health results from impure water and unclean dairy products than from all the adulterated and chemically preserved foods sold within the State, bad as these may be. It is from lack of knowledge that the people perish, while Legislators and Executive Officers too often strain at gnats and swallow camels.

REPORT OF COMMITTEE ON FRUIT AND FRUIT CULTURE.

BY J. F. BOYER, *Chairman.*

By reason of the State not providing as much as blank inquiries to send out to every county of the State, your Committee has thus been disabled from getting the desired information and consequently the facts here revealed are from the central portion of the State. Inasmuch as the Horticultural Society met at Lancaster the previous week, the Chairman of that body having been provided with blanks already alluded to, has thus been enabled to make such a very excellent report of conditions and the fact that that report is recorded in the year book would suffice.

Your Committee would say, however, that the season just passed has been a very remarkable one. The beginning of January, 1907, had almost summer temperature, followed by severe cold weather conditions thus destroying canes of nearly all varieties of raspberries and blackberries and consequently the smallest crop of same for a number of years. Cherries, also, were an entire failure. Pears, only about 10 per cent. of crop. Peaches, in hands of experienced manager on properly selected soil and location, brought forth full crop while thousands of trees not so situated failed to produce even a partial crop. Strawberries; the same can be said as of peaches, from no crop to full yield. Continued low temperature and excess of rain during early part of summer are chief reasons of strawberry failure.

Apples. The yield of this fruit was a full crop in many parts of the State and the qualities good.

It may be safely said that Pennsylvania is not realizing the full measures of its opportunities as a fruit-growning state, with a variety of soil and climate adapted to almost every kind of fruit that can be grown in the Temperate Zone. Why should this be so?

Notwithstanding the glowing reports of the rapidly increasing wealth of the country, the fact remains only too glaring that a majority, at least, of our fruit growers are not at this day in enviable circumstances. Is it because we have not had time and opportunity for developments? No. Is it because we have repeatedly been visited by unfavorable seasons or discriminating circumstances? Is it because our people have been unthrifty and slow, unwilling to work, or extravagant in their living? No. Is it because thousands upon thousands of acres of land have been set in fruit trees, that was not adapted to fruit so set and no attention paid to varieties? Friends, I believe we struck the keynote.

True, we have some individual planters, especially of peaches, who for years have made a specialty of this fruit and have realized handsome profits, but the so-called peach belts have had their rise and falls, and to-day I doubt whether Pennsylvania has 50 per cent. of the peach trees it had ten years ago. Thousands of trees planted never became of bearing age or produced enough fruit to pay the nursery bill. We admit, in these days of narrow margins together with endless pests and diseases, our orchards will succumb quicker or bear less negligence than heretofore. We have also learned that arguments may look reasonable upon paper or sound logical from the platform, but we all know that theory is as worthless as a rope of sand unless it is backed by experience. At the present day an inexperienced man is as much out of place on a fruit farm as a diamond on the nose of a razor-back hog.

With the rapid increase of orchard pests and unfavorable fruit seasons, many of our fruit growers abandoned the idea of growing fruit, and are now falling back to former occupations. Therefore is left a class of fruit growers in Pennsylvania to-day that have stood the test. They are a class of people that have borne and can bear reverses physically. Were it not for this class of people, fruit growing in the State would be wiped out of existence.

This report would be incomplete without reference to a class of fruit growers in this State who laid the foundations of fruit growing, whose followers are dropping out as fast as they dropped in. The former need no encouragements. They are born and raised on the farm and their education is backed by experience. Neither will they be discouraged or encouraged by theoretical arguments.

How many of our so-called scientific men walk along the shore of the great ocean of horticultural truth and only here and there pick up a pebble, while many a man not known as such is actually picking them up in such great numbers that he could stand on the pyramid of this grand and noble State and view this country, would find the glitterings of pebbles as numerous as the stars in the heavens.

POSSIBILITIES OF A SMALL DAIRY.

BY PETER B. COWAN, *Brookville, Pa.*

These few remarks at this time are from the farmer's standpoint and not from the dairyman's. By the term, dairyman, I mean those who are in the business as a business and not as a sideline, like the majority of farmers. There are thousands of farmers all over this great Commonwealth who keep a small dairy, consisting of from two to four cows, solely for home consumption, and few there are who produce enough beyond the home needs to make it attractive from a money point of view. In my judgment there is no one thing more responsible for the boys and girls leaving the farm than the improper handling of the small dairy, with the unsanitary surroundings of the stables, the ill-kept condition of the cows, the inconveniences for handling the milk and butter; the lack of system and the scanty returns, are enough to cause any ambitious boy or girl to desire something more pleasant and remunerative. Go with me, if you please, and view the surroundings of the small dairy, and see the large per cent. of them that are not the most desirable place to eke out an existence. My observations, when coming in contact with these surroundings and conditions, have led me to the thought of the possibilities of the small dairy. Most of our lectures and literature on the subject of dairying treats of it as a separate business, with all the modern improvements for handling the products and the improved methods of feeding with the silo attachments, etc. There is no question of the good they have done when we look at the advancement along the various lines of dairying, but with the small dairy these improvements are slow to be adopted, and it is a question whether the adoption of many of them would be advisable or profitable to the farmer keeping from two to four cows.

The farmer should aim to make the most out of everything and to have his labors bring him good returns. He should also aim to have all the conveniences necessary to make the labor of himself and family not only pleasant but profitable, and nowhere is this more true than with the small dairy.

The small dairy has many advantages to recommend it if it is properly handled. Among them, is the possibility of doing away with the middleman's profits, by selling the products direct to the consumer. This may not always be desirable or possible, but in a very great majority of cases it is. This plan not only brings the producer in touch with the consumer, but gives him a chance to cater to his tastes and thus remove any undesirable traits in his products. I firmly believe that no middleman can accomplish as much in this direction as you can yourself, but he may, unintentionally, do you and your products a vast amount of injury by placing them where they will come in contact with articles which will contaminate them. Go, if you please, into almost any store where they handle dairy products and notice how butter is displayed promiscuously around the storeroom and on the display shelves along the street, coming in contact with the odor arising from decayed vegetables of all kinds, fish, fresh and salted, smoked meats, cheese, lamp oil, and sundry other articles, the flavor of which is not desirable in the products of a well-managed dairy, large or small. After a scrupulously clean and careful butter maker has prepared a gilt-edged article and taken it to the store, it is too often either placed in a case with a lot of off-flavored butter or permitted to set around the storeroom, which is too often filled with the fumes of tobacco, and when the purchaser comes along he is told that this particular roll of butter was made by Mrs. Smith, Jones or Brown, as the case may be, and the consumer finds, to his sorrow, that this particular butter maker uses peculiar flavoring in her butter, not to his liking and over which the producer has no control. The Pure Food Law says that the dairyman must practice approved, sanitary conditions when producing an article which is placed on the market, but it does not offer any protection from the above abuses of their products after they have left their hands. It is possible for the small dairy to remove and overcome, in a large measure, these conditions, by placing their products directly in the hands of the consumer, and while doing this have the benefit of the middleman's profit. It is also possible to maintain a more uniform price, for it is not unusual for the storekeeper or middleman to have two or three different prices in a single day, varying from two to ten cents, and often fifteen cents per pound.

In order to get the best possible results eternal vigilance in regard to cleanliness is absolutely necessary. Do not think for a moment because you have a few private customers that they do not know when they get a good article, for they do, and they will very quickly detect any change in conditions, whether good or bad, notwithstanding the oft-repeated remark that people get used to a certain make of butter. You will sometimes find those who will be harder to please and more exacting than if they bought the same of a poorer grade of goods at a store, but persevere and continue to improve, not only the quantity of your goods but the quality, for the number of careless, indifferent dairymen and dairywomen will always assist in furnishing a market for the better grade of goods, and a very large proportion of your customers will approve and highly appreciate any improvement in the quality of your products.

You will notice that I have kept in view the marketing of the surplus of the small dairy, for I believe it is possible for every dairy consisting of two or more cows, to produce enough beyond the home needs to not only supply a few private customers the year round, but make the income therefrom vastly profitable, both to the farmer and his family. Not less than two cows must be kept if you desire the best results, and as many more as your help will warrant you to keep. It is possible to make this small dairy pay in cash returns, or its equivalent, handsome profits, and if the different products are properly handled and marketed it is possible that they will return you One Hundred Dollars per cow. I am well aware that this assertion will be looked upon with considerable doubt by many farmers who keep a small dairy that produces scarcely more than enough to supply the home needs. To arrive at the possibilities of a small dairy it is necessary to pay the same attention to little details as the larger dairy. It should be arranged so as to have the cows fresh at the right time to bring the best results. This is not a visionary dream of the writer, for he has proven the assertions to be facts in his own experience.

A few years ago when the help question became a serious problem and it was necessary to reduce our operations on the farm, we debated the question as to keeping any cows at all if we could buy the produce needed for the same money as it would cost to keep two cows. A little figuring showed that we could do so and thus save the labor of caring for the cows, but we were confronted with, to us, a more serious problem than the caring for the cows, and that was, where to get a desirable article of butter, cream or milk, and it was decided that we would have to keep the cows ourselves if we expected to be supplied with the kind of products we desired.

Then this question confronted us, is it not possible to make those two cows (for that was all we thought our help would justify us in keeping), pay us a good return for our labor over and above their cost of keeping. We have succeeded in solving the problem, and are well pleased with the results, although not satisfied that we have reached the climax of the possibilities of a small dairy; our cows, as well as other conditions, can be improved. We let the dairymen select what they wanted and we kept the culls, but as we had been breeding dairy types, the culls proved to be fairly good, but it took us some time to get them to bring about the best results. We retail all our products to private customers, and try not to have more customers than we have products so that we can at almost any time furnish an extra pound or two of butter, or a supply of cream, skim milk, buttermilk or cottage cheese, for we find it more profitable to vary our production than to depend altogether on the sale of butter. If butter is scarce and high we try to have plenty for all needs; if it is plenty, and the price low, we try to increase the other products and thus cater to the desires of our customers. We do not have a fixed price for butter, but vary with the markets, only we never come below twenty cents per pound, no matter what the store sells for. Our breed of cows are very sensitive on the matter of price and positively refuse to compete with those cows that produce shilling and ten-cent butter. The other products have a fixed price the year round, and thus we have an advantage by increasing these sales when butter is low.

We try to have our cows freshen at periods that will insure us a constant supply of products for all our needs and bring us the largest returns. We keep these two cows as a necessity to supply our home needs of milk, cream and butter, consequently, we use all of these in the home that is desired and the surplus is what we sell; we have never yet gotten into the custom of selling all the cream and using the skim milk at home.

I will now give you some figures for 1907 to show the possibilities of a small dairy on our farm:

Received from the sale of butter,	$103 00
Received from the sale of cream, cottage cheese, skim milk and buttermilk	89 02
Received from the sale of veal,	24 09
or a total of	$216 11

When we see that the home consumption is equal to the cost of the keeping of these two cows, we consider this a very creditable showing and feel that we are amply repaid for the labor expended.

We are sometimes asked if it is not a considerable task to market this small product every week. In answer we say, "No," for while we are marketing the products of the dairy we try to have other things to market at the same time, all of which we retail to our customers. We very rarely go to market with dairy products alone.

GROWING BEEF.

BY S. E. BRADFUTE, *Xenia, Ohio.*

Gentlemen of the State of Pennsylvania: Perhaps some of you may have heard me discuss this subject somewhat along the same lines before the Livestock Association at Pittsburg, when the meeting was held in that city. I shall perhaps treat the subject a little differently, as we are constantly trying to improve along these lines.

In the splendid address to which we listened this afternoon, we learned that the American farmer is not succeeding in getting the yield per acre of grain that the farmers of other countries are doing. I think we are all satisfied that this is due to the fact that the American farmer has been doing entirely too much skimming in his process of farming. He has skimmed lightly over the soil, drawing out its fertility and then gone farther west and repeated the process, and then going west and going west. That is not only true of the grain growing districts of America; it is also true of the beef and cattle industries of America. Well do I remember of often hearing my grandfather—you see my family have been interested in the growing of beef in the same territory for nearly a hundred years—often have I heard my grandfather talk of feeding his steers and driving them over the mountains to Philadelphia and Baltimore. Of course, that part of the business has long since gone. The steers that was grown then was, of necessity a strong, vigorous, bony fellow, that could stand the strain of traveling for days without losing too much flesh, rather than the one we want to-day of less bone and more meat. The larger part of the cattle men have drifted west, because it was easier to grow cattle, the same as it was to grow wheat. As the grass disappeared in one place he drifted further west, and still further west, until to-day the cattle grower has practically come to a stand still in that direction. It has, in my judgment, practically reached a stand still, and the large tracts that were once the grazing ground of the cattle are being cut up into smaller farms. We find the people that have been doing this, returning from the west, returning from the skimming process, to the east, and beginning to do things right. And I predict that the same thing will occur in our cereal growing. We will have to do things, and do them right. Now, the very fact that he had these large ranches in the west to compete with, made the man who would grow in the east, produce a better article. If they in the west could grow quantities which we in the east could not reach, then the only thing left for us to do was to grow a more approved quality, one which was in demand. The time was when they raised steers to weigh from eighteen hundred to two thousand pounds, but to-day that is not done in this country; the steer that is most in demand is the one weighing from twelve to fifteen hundred pounds, and it would not be objected to if he did not weigh over twelve hundred pounds, if he reached the market of sufficiently high quality.

Now, the question arises here as to whether or not there is any chance of financial success in breeding to these ideals in this country, and I have some facts here that were furnished by the Chicago market; I have taken the Chicago market because I know more about it than any other market, and because they handle more cattle there than they do in the Eastern markets. The last five years preceding this one, the average price of the steer brought from the west, and sold in Chicago, up to the weight of fifteen hundred pounds has been $6.03 per hundred. On the other hand, the average price of steers weighing nine hundred pounds, that have been sold in Chicago—of course, that includes some of the very inferior class—and a great number of the feeders weighing up to nine hundred—those weighing nine hundred pounds have averaged $4.40 per hundred, a difference of $1.63 per hundred, or 27½c. of each hundred pounds that is added between the nine hundred and the fifteen hundred pounds. Now, that does not always prevail, but it is a voucher we may use in arriving at a conclusion that it would pay us to feed the steers heavier than we have done up to fifteen hundred pounds. That is, we have 27½c. for each hundred pounds again. We can be pretty sure with this to go on, but in order to make sure that there may be no mistake, we will go a little further, and we find that for the past fourteen years, the average price of the fifteen hundred pound steer was $5.51 per hundred, while the average price of the nine hundred pound steer was $4.25, a difference of $1.26, or 21c. for each hundred pounds higher.

I think we can safely say, therefore, that there is a gain of over twenty cents for each hundred pounds that we put on the steer. Now, it sometimes happens that if the steer is of sufficiently high quality, that a low weight steer will sell very close to, or even sometimes in advance of the heavier steer, and I wish here to read a short article from a Chicago paper, "The Stock Yard," of last Friday, which will give you some idea of the present market, and the indications that are held out:

"Basing on supply and demand there will undoubtedly be an excellent market in the present year for finished stock especially choice quality, and it is quality that counts, as for instance this week, two lots of over one hundred and sixty head of fancy 'fully matured'

1038 pound and 1185 pound yearlings sold at $6 and $6.25 respectively while poor quality and poorly finished 1000 to 1200 pound 'so-called' fat cattle sold as low as $3.60 to $4.00. But, then again, comparatively few even 'fair kind' of killing steers sold below $4.75 while a number of choice 900 to 1100 pound 'well finished' yearlings, including steers and heifers mixed, went at $5.00 to $5.75. On the other hand choice 1500 to 1600 averages sold at $5.75 to $6.10, with a 'sprinkling' at $6.15 to $6.25, but these prices will undoubtedly look low after a while, unless all signs fail."

The point I wish to make here is that we have reached the time when the Eastern farmer must be upon the market with choice 1200 pound steers, that will sell as high or higher than any other steer that can be grown. Now, if we are going to grow 1200 pound steers, I think we should establish pretty clearly what kind of a steer that steer must be. That steer will not be one that has come from a cross between some beef breed and a dairy breed, nor will he be a steer that is made up of some dairy breed. He will be a steer of a pronounced beef breed. He will be a steer possibly—probably of one of the three or four great beef breeds. If not, he will have a large percentage of the blood, and at least one or two crosses of the best beef breeds. I am not here to advocate any particular breed of cattle. I care not what the breed is, so that the animal is made right, and is of the right stamp, and has the right standard. There are four or five good beef breeds, and any one of them will make a good beef steer if fed right, and I will say that with the particular breed a man likes best he will succeed best. All things being equal—I would prefer him to be hornless, because it aids largely to safety in handling him. I think I hardly need describe to this audience what this steer should look like. He should be well built and he should be compact, pretty close to the ground; the closer the better; I have never seen one too close to the ground; the bone and the muscle should be fine, and he should be well rounded out. His back should be especially good. He should be wide across the shoulders, and wide behind the shoulders, and wide all the way back. The shape of the back should be arched, like this, not hollow, like that. Frequently you will see the back of an oval shape, and when you see in a steer that is broad in the back, a tendency to let the back down, I would rather see it than have the back up. Then I want the hind quarters well rounded out, and well built, and then I want a nice head on this steer. A nice head. I have heard a good many old fanciers say that if they saw the head of the steer coming round the corner of the barn, they could tell the character of the steer from it. I don't doubt it, and I have no doubt that there are men in this audience who can say the same thing. It should be remembered that the short head means an easy feeder. The long headed steer is not an easy feeder. Then I want quality, and I want a steer that is full of quality. I never heard anybody who could define what quality is, and do it well. Quality is one of the best things you can have in a steer. When a steer is easily finished and you can see the muscles stick out over the fat when he walks around you, when he is well rounded, and firm, not too firm, but just firm enough, he has quality; you can't tell just what it is; you must see it, and become acquainted. It is one of those things that when you see a steer that has it, it will almost make the saliva trickle the side of your mouth. You can almost taste him. That is quality. It is going to do something; it is going to make something; and that is the kind you want.

And then you want a gentle steer. I have no use for a wild steer, and still less for a wild man to feed him. You want him quiet and gentle, and well acquainted with you, so that you can go up to him at any time and put your hand on him. I am not talking about ranch cattle, but about cattle in Pennsylvania. I want that steer to be gentle, so that you can go up to him, and he knows that you are his friend, and he recognizes you, and knows that you will do good things for him if he gives you the chance, and will do good things for you.

Now, I have described some of the things I want. I have a picture here that is perhaps not one of the best. I have never been able to get an artist to make one that I consider quite right. Another thing: I have never been able to produce a steer that is quite right. A man who can produce something that comes up to his ideals is apt to have rather low ideals, and will never see very much to improve. I want his ideal to be so high that he cannot reach it. In the second cut you will notice that we have this steer cut up as we would have him cut up in the eastern market. You will notice the one thing to which I want to call your attention, and that is, that the valuable meat on that steer is with one exception, along the centre line, and is between the word "chuck" and the word "rump" practically. In other words, two-thirds of the value of that steer lies in one-fourth of his carcass. Now, I said to you that it was necessary to have a good back, and it is necessary, because, as you see here, two-thirds of his entire value lies along his back, extending slightly down to the sides. Now, then, those of you who are acquainted with the dairy cow, will understand why the dairy back—the wedge shaped back—means that you do not have the back on which to build a beef steer. I am not here to say that you cannot take the dairy breeds of cattle, and make as many pounds of meat from them. I am not here to say that, but I do say that you cannot make as good a showing for the amount of feed they have received—perhaps good feeders can do it, but I am here to say that when you get these pounds, you have not got them in the right place. You have not got them in the one quarter of the back lines that will produce the best value in the beef steer. And when you have the necessary fat on the dairy animals, you have not got it in the form that you want it. You have the fat outside, and the lean inside, whereas you want it marbled, a streak of fat and a streak of lean, and this you cannot get in the dairy animal. At least, I have never seen it, and I have seen a good mny of them come up. You cannot get it marbled; you get the fat on the outside, with the pure lean meat between. That is the reason the beef man will not buy the dairy cow. He will have to sell that meat at a lower price if he handles it at all.

Now, that we know the right kind of a steer, and the kind of a steer we want, how are we going to get it? A great many of you will want to grow him from calf-hood, from start to finish, and if so, you will want to begin much farther back than that. You will notice that in the human family, certain families of men are inclined to be fleshy. They don't eat any more than the lean fellows do—

sometimes not as much, but they are fleshy. The same thing is true in animals. They run to flesh, and they do it on less feed than some of the others. While I admit that you might be able to put this flesh on the dairy cow, I contend that you can do so on the beef steer with less feed. If you are going to start in with the calf, I should like that calf to come in the fall of the year—in October or November. There are two or three reasons for this. True, you will have his dam to keep during the winter, but I am going to suppose that he is going to nurse his own dam. If he cannot do this, and you have milch cows, take them, and give him the warm milk, and you may raise him in that way; or, if he cannot nurse the cow, simply give him milk that has been warmed, and you may raise him that way, but in my judgment you cannot raise him as well as if he nurses his dam, or some other good milch cow. So far as I know, there is only one thing that is better for the calf than milk, and that is more milk. I have never given the calf after he comes and learns how to handle it himself, any help in feeding. I like to have him go in the barn at the start; it gets him used to it—and you Pennsylvania people have good barns—and you can be with him every day, and he becomes accustomed to you, and becomes gentle. He becomes accustomed to watch you, and you can see what he is doing. After he gets so that he can eat, I like to give him a little shredded corn on a shelf where he can easily reach it. If there are three or four of these little fellows together, all the better. I give them just a table spoonfull or two, for the three of them, and then let them nurse twice a day. You will find that the cows are much easier to milk afterwards, and will give you more milk, if you keep her in the barn, and let the little fellows go in there morning and evening and nurse. If you let her go out in the pasture with him, she will run, and half her milk will be wasted, and she will not do so well afterwards.

Then I would like these little calves kept in a nice, roomy, light pen, not back in the dark. Then he should take water often, and go out every day. It cannot hurt beef cattle to get out into the air. In fact, the finest cattle we have, the International Prize Cattle, spend most of their time outside in the air. I believe that one of the troubles of tuberculosis cattle is due to the fact that we do not allow them out in the air enough. This pen should be light and airy. Then let these little fellows get on as quickly as they can. It should be thoroughly understood that the first five hundred pounds is the cheapest you put on him, and the second five hundred is the second cheapest, while the last five hundred pounds is the highest priced of all. Now, when he comes in the fall, he really does not cost much besides his milk; perhaps it costs a little more to feed his mother, but your calf gets very little high priced feed. Then when spring comes, you find him ready to go out to pasture, and feed himself on grass. The second six months are the second cheapest, because he will be ready to feed himself in pasture. If he comes in the spring, the first six months he feeds on milk, and the second six months he feeds in the barn on the highest priced feed you can give him— the protein. So I would say that the first thousand pounds, which he will weigh in possibly twelve months, probably fourteen or fifteen, are the cheapest if he is born in the fall. In my judgment, the calf that comes in the fall is the cheapest calf.

Now, again, in the growing of beef cattle, it is not necessary to have a closed barn, such as you must have with dairy breeds, as many of you know. After my calves are six months old, or more, I would prefer to have them in a pen open toward the south; closed on three sides if you can have it that way; and then have them feed right out there in the pen. This is the ideal way, in my judgmen, to feed steers right out there in the pen. If that calf has any particular trend, you can see it, and will soon learn to know it, and as a matter of fact, that calf will probably be what you make him the first six or eight months. I do not believe it necessary to carry stockers. You hear it said that it is, but I do not agree with those who say so, and after all, you simply have their word for it. You do not want an animal that does nothing. You want a steer that will be born to-day, and go to work to-morrow, and work until he goes to the block; then you have a steer that is doing something for you. That is a steer that is worth having, and when you see one that can not do it, the sooner you get rid of him the better it will be.

Now, I think that one of the troubles in the steer feeding business is that we have been practicing too much the teaching of critics, and following experimental methods. A few years ago it was declared the way to feed steers was to husk the corn, and then buy some high priced feed to mix with it, and go to a whole lot of trouble and expense. It can be done and it will make good steers. There is no doubt about that. I think, however, that you will find conditions here very much like in the west,—that it costs money to husk the corn and grind it up and feed it to the steers. It is adding about one-third of the cost of the corn to it, and you do not receive anything like one-third more value in results. Indeed, it is not shown that you have added much to the feeding value, if anything. I remember distinctly, some six or eight years ago, advocating the return to the older and simpler methods before the Illinois Live-stock Breeders' Association, and I don't know when I have had as brisk a currying down as I received there that day at the hands of some of those—what shall I call them, scientific farmers?—if these learned men here will pardon me, I will let it stand. They said it was too much like an old fogy way, but I want to say to you that the Illinois Experiment Station has been following some of these methods, and they have found out that the old fogy ways were the best after all. They found they did not get any better results by feeding broken corn than they did by feeding in the old fashioned way, the corn in box with the fodder. I admit that you will gain a little more, apparently by the other method, but if you will follow out the case, you will find that in the end you have lost especially when corn is not too high priced, and even with corn as high as it has been this year, it is poor economy, in my judgment, to grind that corn and shred that fodder. You must remember it takes time to feed in that way, and then it costs to get the corn ground. With us it costs 5c per hundred. Then you have to add the cost of the machinery. At least this is the case with us farmers in Ohio, and I don't think it is different in Pennsylvania. So I don't think they can establish that it pays to feed cattle in this way, or that it is a better method than feeding the cattle in open pens where the man can watch them feeding, and become acquainted with them.

To the man who goes into the work thoroughly, and right, there is money in cattle breeding. I would not advise the theorist to try it. Theory does not achieve the same results as hard, practical work and knowledge. If you are in the work for success, and are willing to work for it, success will come to you, if you like the work. I don't believe that any man succeeds, as a rule, in a business he has no liking for. There should be a natural liking for the business, and a determination to succeed. Then he will set out and experiment and improve, and he will keep a record of his methods, and when he has found one that succeeds with him, he will keep it. Now, there are many small farmers in Pennsylvania, as in Ohio, where it seems strange to me that a man does not keep a few beef cattle round his farm. There is always a good deal of feed around the farm that is of no particular value, and which these cattle would thrive on. Out in Ohio this year, for instance, we have a good deal of soft corn, for which there is no market, but beef cattle will eat it, and put on flesh on it. Now you may not get quite as good a gain on it, as on the other kind, but it would be a waste to you, and they put on flesh, and thrive on it. Now, you will have something like that every year, that will practically go to waste on the farm, that he could turn into a few beef cattle, raising four, or five, or six of them, that would bring in a nice return. And in connection with these beef cattle, it is well to keep a few hogs, which can be fed on the shocked and broken corn that would otherwise go to waste, and in figuring the profit on your steers, it is also necessary to include the profit on your hogs.

Now, the question is often asked, "Can you give us facts and figures to show this?" and I will say to you very frankly that I am not prepared to do so, but I can refer you to a lot of men who are making money by these operations, and I can refer you to a lot of farms that are getting rich by this process, not simply holding their own, but getting rich. I said to you earlier in the evening, that we have skimmed the surface of our farms, and gone west, and gone west, and gone west. Now, we have got to come back, and put back into our ground some of the richness we have skimmed off. Now, we have to put the fertility back to our land, and if you are going to grow grain there, there is no better way than by putting on that land some live stock. Nothing better has been found. Now, if you are a dairyman, well and good, but if you have no dairy market, and need to fertilize your land, I know of no better method than to start in beef growing; it is one of the best methods of fertilizing and improving farms that can be found.

Now, I want to say only one other thing. If you start in the cattle growing business, you will naturally want high class stock, and the man that is a success at growing beef cattle, or cattle for any other purpose, will usually be a high class man. If you see a high class animal, you will see a high class man round somewhere; he will be a success, and he will breed the best animals that can be put on the market, and he will know his business.

REPORT OF THE ORNITHOLOGIST.

BY PROF. H. A SURFACE, *Harrisburg.*

During the past year the correspondence by your Ornithologist, concerning birds by which was directly traceable to his position with this honorable Board, has not been very great, but the correspondence and receipts of specimens of birds in his office of Economic Zoologist has been considerable and worthy of note here. The list of specials of which specimens were received or inquiries made during the year 1907 is as follows :

American Bittern—2 specimens.

American Goldfinch or Thistle Bird—1 specimen.

American Goshawk or Northern Hen Hawk. Several specimens received last fall and before that time practically none received. This shows there was then a flight of them to the South.

Barn Owl—1 specimen.

Brunnich's Murre—1 specimen.

Birds—Notes on Arrivals. Observations. How to Preserve Birds. Foreigners shooting birds. Not killed by spray liquids. Fall migrations.

Blackbirds, injuring English Walnuts. How to get rid of Blackbirds.

Bluebirds—4 specimens.

Blue Heron—2 specimens.

Bluejays—4 specimens.

Broad-winged Hawk—1 specimen.

Canary—1 specimen.

Carolina Rail—1 specimen.

Catbird—2 specimens.

Cedar Bird—1 specimen.

Cedar Waxwing—3 specimens.

Chickadee—1 specimen.

Chipping Sparrow—3 specimens.

Crossbill—6 specimens.

Crows—8 specimens.

Dipper—1 specimen.

Duck Hawk—1 specimen.

Eagle, Bald—1 specimen.

English Sparrow, suppression of—2 specimens.

Flicker—3 specimens.

Grebe—1 specimen.

Grebe, Horned—2 specimens.

Green Heron—2 specimens.

Grosbeak, Cardinal—1 specimen.

Grosbeak, Pine—4 specimens.

Hawk. One specimen killed 19 birds. Protection of Hawks. Specimen in Barn.

Young Hawk—1 specimen.

Hawk, Cooper's—1 specimen.

Hawk, Red-shouldered—4 specimens.

Hawk, Red-tailed—1 specimen.
Hawk, Sharp-shinned—5 specimens.
Hermit Thrush—1 specimen.
Hooded Merganser—1 specimen.
Junco or Snow Bird (Slate-Colored Junco)—1 specimen.
Kingfisher—1 specimen.
Lark, Meadow Lark—1 specimen.
Logger-headed Shrike—1 specimen.
Long-eared Owl—1 specimen.
Marsh Hawk—2 specimens.
Maryland Yellow-throat—1 specimen.
Murre—1 specimen.
Night Hawk—1 specimen.
Nuthatch—1 specimen.
Oriole—1 specimen.
Osprey—1 specimen.
Oven Bird—3 specimens.
Owl, Screech—2 specimens.
Owl, Grey Screech Owl eating a White-winged Crossbill—2 specimens.
Owl, Great-horned; this species devoured a Screech Owl. Protection of—3 specimens.
Pheasants, Breeding Meal Worms for Food of—1 specimen.
Owl, Barred—1 specimen.
Pigeon, Wild, inquiries concerning.
Red Bird.
Red-breasted Merganser.
Red-winged Blackbird—2 specimens.
Robin feeding upon Cutworms—1 specimen.
Robin charmed by Blacksnake.
Rose-breasted Grosbeak—1 specimen.
Ruby-throated Hummingbird—2 specimens.
Sapsucker, Red-headed.
Scarlet Tanager—2 specimens.
Short-tailed Shrew—2 specimens.
Song Sparrow—5 specimens.
Sparrow Hawk—3 specimens.
Sparrow, Java.
Vesper Sparrow—1 specimen.
Whip-poor-will.
White-breasted Nuthatch—1 specimen.
Woodpecker boring in solid wood.
Woodthrush—1 specimen.
Wren.
Yellow-bellied Flycatcher—1 specimen.
Yellow Warbler.

Our records show that there were several specimens of the American Goshawk or Northern Hen Hawk received last fall, and before that time there were practically none. This shows that there was a southward flight of them from the northern counties which they inhabit and where they breed and spend the summer. This is one of the birds that is not protected by law in Pennsylvania, although it is rare and only a winter migrant.

We have received further reports concerning Blackbirds injuring English Walnuts by puncturing them while they are soft and growing upon the trees. As reported last year, their purpose in making this injury is not known to us.

A great deal of our correspondence has been upon the subject of the English Sparrow, due to a bill introduced in our State Legislature by Hon. William Barnhart, providing for a careful and accurate investigation of the economic features and habits of this bird and the methods of destroying it if found advisable, and the publication of a special bulletin upon this subject, also appropriating one thousand dollars ($1,000) for this purpose. It is thought its failure to pass the Legislature was due to the provision calling for "investigations" of the Sparrow, thus giving him a fair chance to be tried. It is our opinion that had it called for the extermination of the Sparrow, it would have received favorable action by the Legislature, but the important question would then come as to the methods of exterminating the English Sparrow in a way that would prove safe, effective, and not too expensive. Various methods would have to be devised and tested, and we fear that after all is said and done we must acknowledge the presence of this nuisance of the feathered tribe as a necessary evil that can not be abated.

One correspondent wrote us that he had succeeded in poisoning the English Sparrow and destroying it in his region by the use of poisoned millet seed. He fed the birds on untreated seeds until they became accustomed to them,and after a few days soaked some millet seed in water with a very slight touch of strychnine added, and then dried them and mixed one part of these poisoned seeds with nine parts of unpoisoned seeds. The birds ate this mixture without suspicion and were killed by it. He said he found wheat grains too large to be readily swallowed by the English Sparrow without it having to taste the bitterness of the strychnine and become suspicious of the material as a food. This is a suggestion worthy of the action of persons desiring to kill the English Sparrow and thus avoid loss by its ravages and driving away our native birds. It should be remembered that poisoned grain of any kind must be placed where it will not be found and eaten by poultry.

The last Legislature also saw the introduction of a bill providing for making the Flicker a Game Bird. This was championed by a representative from one of our eastern counties, but upon the appearance of your Ornithologist before the honorable Committee on Agriculture, by invitation of said Committee, and his speaking in behalf of the Flicker, showing that it is a beneficial bird and should be preserved, the bill fortunately died in committee.

The Screech Owl fortunately is becoming more abundant in some portions of our State, as popular sentiment is increasing for its protection, and it is permitted to nest and remain in hollow trees and posts and other available places in boroughs. As it increases in number the English Sparrow and mice, upon which it chiefly feeds, decrease perceptibly. We have recently had a very gratifying report from Coatesville, Pa., confirming this statement. The Screech Owl is among the chief enemies of house mice and the English Sparrow, and we hope to see it faithfully protected around buildings and in villages where it should become much more abundant.

One of our peculiar records is the finding of a Screech Owl in the stomach of a Great-horned Owl. It is well known that owls are sometimes cannibals.

During last spring we had a very interesting experiment with the Robins apparently pulling cabbage near Harrisburg. The account of this was published in our July Bulletin and attracted a great deal of attention. It is as follows:

ROBINS DESTROY WIREWORMS.

Difference Between Observation and Interpretation.

It frequently happens that certain facts are observed definitely and consequently can not and should not be denied, but the interpretation is such that might lead to quite erroneous conclusions, and even evil results. One of the most important duties of the teacher of Nature Study or any branch of Natural History is to give training not only of the minute observation of facts, conditions and phenomena, but also their own interpretation and practical application.

An important case illustrating the difference between interpretation and observation is seen in that of a truck grower near Harrisburg, who recently observed Robins at work in his cabbage field, apparently pulling the cabbage plants in numbers, and he at once shot quite a number of the birds. When brought to trial by the Game Commissioner, he acknowledged having shot the birds because they were destroying his property in pulling the cabbage plants, and testified that he had seen them take the plants in their bills, pull them up and throw them aside. He was not certain that they ate any part of the plant nor anything near the plant, and it might have been thought that they were doing it only for mischief. Doubting such an unusual occurrence as Robins pulling plants for the purpose of destroying them or without some definite and doubtless beneficial end in view, a representative of the office of the Economic Zoologist went with the Game Commissioner to the truck field where the cabbage was growing, and there they saw, indeed Robins in considerable numbers hopping over the ground, and often stopping to pick up objects, and even scratching in the ground with their bills, and then eating something. They were particularly busy quite near the cabbage plants, and a number of plants were seen lying on the ground beside the hills, wilted and dying. A careful examination revealed the fact that the plants had been cut off rather than pulled out, and in at least one case the Robin was seen to throw aside one of these plants, which had been cut off but was yet standing in its hole in the ground. Around the foot of the plants and just beneath the surface of the soil worms were to be found by the hundreds. It was found that the wireworms had cut the cabbage plants, and the Robins were busily engaged destroying these very injurious pests for which there is practically no remedy, after they appear, and of which there are far too few enemies. The facts were that the truck grower observed the Robins at work around his cabbage plants, and perhaps occasionally lifting out some that had been cut off by wireworms, and he jumped to the conclusion that the Robins were pulling his plants, and proceeded to shoot his most beneficial friends. The correct interpretation was that the plants were cut off by pests for which there is no practical remedy at this time of year, and the Robins were feeding extensively on those pests, but as some of the plants remained in the ground where the wire worms were to be found, although cut off and dying, the birds found them in their way and threw them aside. It is doubtful if the killing of the birds was justified under such circumstances, even with the positive and conscientious belief that they were doing damage. It was the duty of the truck grower to ascertain the facts of the case and act intelligently upon them, fully as much as it was his duty or privilege to protect his crops.

Details of the above case are published for the sake of emphasizing the importance of correctly interpretating what is to be observed in Nature, and acting most intelligently and properly. It is generally wrong interpretation of observed facts which leads to the common popular errors concerning Natural History subjects rather than mere fabrication of false belief. For example, the popular erroneous idea that there is a Horn Snake with a poisonous sting in its tail appears to be founded upon the observed fact that the House Snake or Milk Snake has a tail that is rather hard and pointed and from the observation of this, the story of the Horn Snake appears to have grown. It is to be hoped that readers will join in aiding the work of the Economic Zoologist to ascertain and publish the truth in Nature.

There has been a great deal of complaint concerning foreigners shooting birds. It appears that in the Old Country even the smallest birds are shot and trapped for food, and foreigners do not learn to respect our laws in this regard. The Game Commissioner has had a great deal of trouble in attempting to enforce the laws for protecting birds among foreigners, especially in the mining region. His efforts are commendable and good results are seen.

We have received inquiries concerning spray liquids killing birds, and have replied to the effect that we believe this never results. The only way in which poison could be taken or such results could occur would be by the birds eating insects that have been poisoned by feeding upon foliage holding arsenical insecticides or eating poisoned fruits. As birds do not eat dead insects this can not occur as one of the undesirable results of spraying.

Something has been said concerning the introduction of Pheasants in this country. This is commendable and could no doubt be made successful. The Pheasant in its habits can be considered as intermediate between the Ruffed Grouse or our common game bird commonly but wrongly called the "Pheasant" and the domesticated Guinea. It would thrive along the edge of thickets and in partially open pastures, in practically the same places as the Quail preferred when it was abundant in this State. It is a beautiful bird, insectivorous and seed-eating in its feeding habits, and might become one of our important game birds. It has been successfully introduced along the western coast of the United States, and we know of its breeding undomesticated in the State of New York. We would recommend it as a bird to propagate and introduce in this State.

The reduction of the number of Quail by severe weather during the past two years has been quite perceptible. The Quail is one of our most valuable insectivorous birds, being destructive to potato beetles, grass-hoppers and other obnoxious insects. It is also an important destroyer of weed seeds. For this reason we earnestly recommend the endorsement of legislation proposed by our State Grange at its last Annual Meeting, calling for a closed season of five years for the Quail or Bob White.

Concerning the Game Laws of the State of Pennsylvania we should offer a paragraph:

The law at present provides bounties upon certain animals as follows: For each wildcat, four dollars; for each fox, two dollars; for each weasel and mink, one dollar.

We agree with the publications of the Biological Bureau of the U. S. Department of Agriculture, to the effect that bounties are not justifiable, cost too much, and do not bring the desired results. If creatures are sufficiently obnoxious to demand the efforts of mankind in exterminating them this will be done, bounty or no bounty.

All species of birds are protected by law in this State at all times excepting the Bluejay, English Sparrow, European Starling, the Kingfisher, Cooper's Hawk, Sharp-shinned Hawk, Goshawk, Duck Hawk, Pigeon Hawk, Great Horned Owl, Barred Owl, the Crow and the Raven, and the game birds which are to be shot only during their respective open seasons, and which are named by our State law as the Quail, Ruffed Grouse, Prairie Chicken, Imported Pheasant, Wild Turkey, Wild Pigeon, Dove, Reed Bird, Rail, Blackbird, Sandpiper, Tatler, Curlew or any Shorebird, Wilson Snipe (Jack Snipe), Upland or Grass Plover, Coot or Mud Hen, and Water Fowl known as Duck, Goose, Brant, Swan and Grebe. We can not see the justification in having the Dove, Blackbird, Coot or Mud Hen and Grebe upon the list of game birds, as the first named is the only one that is edible, and the others would be shot only for useless "sport." The law provides, fortunately, for an absolutely closed period upon the Wild Pigeon until April 22, 1915. However, it is our opinion that at that date it will be found, unfortunately, that there will be none of these very interesting birds in our State.

The Audobon Society is growing stronger both in Pennsylvania and in the United States and is doing good work in bird protection and in creating and maintaining public sentiment in this regard. In the Report for Pennsylvania by the State Secretary, Miss E. W. Fisher, which was published in "Bird Lore," Volume IX, No. 6, for November and December, 1907, is the following:

" * * * The business of reorganizing the Society on this permanent basis represented most of the 'new work' done this spring, but the old activities were still kept up. Twelve circulating libraries were kept moving in the State, and a number of school children and children in societies, such as 'Bands of Mercy,' etc., have signed the Audobon Pledge and received certificates of associate membership.

"The increase of the public sentiment for bird protection has been quite marked during the past year in this State, largely due to the good work done by the State Zoologist, and the Audobon literature distribution in schools. Indeed, it is to the intelligent work of the public school teachers who take up the subject that the Audobon society owes some of its best results in the country districts.

"The society hopes to follow up its organization this winter with several public meetings, where illustrated talks will be given by those prominent in bird protection and ornithology (which seems still to be one of the most successful ways of reaching the general public), and by special work among the schools."

Considerable literature has come to our desk. One of the most commendable was Bulletin No. 30, by the Biological Survey, of the U. S. Department of Agriculture, entitled "Birds of California in Relation to the Fruit Industry." This consists of one hundred pages with five plates and will prove of considerable interest to bird students. We regret to be obliged to chronicle the suspension of a valued and interesting publication known as "Birds and All Nature," by the Nature Publishing Company, of Chicago, as this pictured objects in natural colors, and was commendable in its popular instruction. The Ornithologist of your Board has prepared a set of colored slides of birds and occasionally gives popular lectures on this subject, the last having been as recent as last Friday night to a church audience in Harrisburg. We recommend further activities in bird protection and intelligent legislation along this line.

Several reports have reached us concerning the increase of the English Starling and the damage done by this bird, which appears to be in its habits and haunts or place of living intermediate between the Blackbird and the English Sparrow. We regret its introduction into this country, and recommend its destruction. It appears to be a grain eater and fruit eater without much value as an insect killer. We here show specimens of the same, with the hope that it will be more readily recognized than from descriptions. These specimens were kindly loaned for this purpose by Dr. William Deutcher, of the American Museum of Natural History, who is president of the American Association of Audobon Societies. The Starling resembles a brownish blackbird with white specks or small spots on the back, but its long-drawn whistling note enables it at once to be distinguished from any blackbird found in the State.

REPORT OF GEOLOGIST NO. 1.

Soils, Forestry and Practical Geology.

BY DR. ISAAC A. HARVEY, *Lock Haven, Pa.*

Upon assurance that I might be indulged in some digression from the usual and routine or conventional form of report, I venture to submit some thoughts, in a cursory way, on Soils, Forestry and certain aspects of Practical Geology, as it affects the material interests of the farmer.

In the past year, I have received very few inquiries relative to the various subjects, which, in my province as an Economic Geologist, are of direct import or concern to the farming community; but I have been engaged, largely, in the development of mineral properties, and assume that it is entirely proper to avoid any technical discussion, awaiting opportunity, therefor, perchance, in the future, or leaving the same to the gentlemen, who, as specialists, have had more direct and actual experience in these matters, as relating to Agriculture or Practical Farming. I oftimes observe, however, the varying qualities, diverse origin and apparent composition of soils, as I make investigations through various portions of the State and in many counties, and it is a query with me, what experiment may determine as to their use or adaptability for special or general cultivation; that is, in the several shifting stages of deposit as derived by erosive processes from the most recent to the most remote geological formations, exposed in the State, with their diverse chemical constitution or structure. It seems to me, that the work of the analyst or chemist, alone, will solve the true genesis of Soils and their actual utility and adaptability; in connection, also, with continuous experiment. From the head waters, the springs or fountain heads, of our rivers, and, especially, in the coal measures, I have, incidentally, observed the detritus, the debris and the alluvium, produced by erosion, weathering and the slow disintegration, from which our soils are derived, with their components of Silicia, Alumina, Lime, Carbon, with traces of Iron, Soda, Potash, Magnesia and other elements, for the most part mechanical and inert, and yet how much is soluble, as these soils, apart from their vegetable matter, are produced by the action of water and the atmosphere, and all of the chemical elements are not entirely inactive. Following the course of the various streams, or tributaries, and of our rivers, their entire length, from the Coal measures, through the successive formations, to the Gneissic or Azoic Rocks, as exposed, and including sandstone, shale, slate, limestone, clays and the other deposits of rock and minerals, represented by the numbers, from I to XIV, of our State Geological Survey, with some even more recent as well as remote strata; the differentiation of soils, whether as alluvium or permanent deposit, would be an interesting and useful study, and by the application of chemistry and experiment, thereto, some new facts may be derived that will contribute, more directly, to their practical availability.

I have thought much on this subject, while making a study of the geological aspects of the several counties, and have wondered what the outcome would be, if the composition of these soils, from the source of the rivers to the shores of the sea, would be divulged or determined. For instance, the superior crops of buckwheat, in certain districts which will hardly produce other grains so well, and the excellent growth of vegetables on the hills of the northwest counties, defective in some cereal crops or growth, and, indeed, surpassing in some respects, the product of the lower counties, are suggestive of some queries and experimentation which may reveal other important facts, that will be a direct guide to the farmer in the use of these varying soils, and enable him, more certainly and intelligently, to cultivate the same. But, to my mind, a more urgent and insistent subject and one of more import directly to the farmer, is the preservation and restoration of the forests—our timber and trees; for what farm is a home without woodland, and what so much enlivens the hill valley, mountain or plain, as trees,—abundant timber, in its native or even its cultivated production or growth. Deforestation is desolation, and without trees we are without a certain inspiration, a resort, a sylvan retreat, which in its pristine beauty, was wont to lift us, sensibly into higher thought and nobler spirit. We are nearer to and almost in touch with, the infinite, so certainly as we are in the forest,—the wilderness; and never quite so free from our own evil fancies, rancors and enmities, as we are in the native woodland or in the mountains with their varied growths of Oak, Pine, Chestnut, Fir, Ash and the many other beautiful trees. We are never so free from care and the anxieties that beset us in business life or in the marts of trade, as when we leave our busy affairs and go among the trees.

It seems to me that no one, either in respect to his material benefit and actual happiness, should be more interested in, or more devoted to, forestry than the farmer, and the prevalent destruction of forests, regardless of economy in a material or financial sense, or in its moral bearings, is hardly short of vandalism and does not have that regard for those that come after us, which every consideration of kindness and foresight for them should certainly prompt or inspire. It is a clear proposition to my mind, and a truth, that nature, if protected, supported, encouraged and aided, will supply every generation with adequate timber, from the lands already denuded, and it is the insistent duty of all citizens to observe that dictum and give nature and the native trees a chance. The State's purchase of lands for a nominal price, is a step in the right direction and these areas, in thirty-five or forty years, will afford vast quantities of saw and structural timber for all uses. True, one single year of growth, on a given tract, would hardly show, to the casual observer, any perceptible gain or value; but, in three or four decades, with the trees safe from fire and carefully guarded from other sources of destruction, the results would astonish any one who would figure the actual aggregate value, that would thereby be produced, in trees of varying growths and kinds. Do your part and nature will do the rest; and I am sure that the study of forestry, with its direct advantages to all, will appeal to your good sense and become, increasingly and absorbingly, a subject of actual interest and of energetic effort on your part and in the right direction.

While the soil of the surface and the growth thereon, whether of tree, fruit or grain, is of great import, and, apparently, of the most value to the farmer, I apprehend, that the deposits, unknown and undiscovered, that lie beneath the surface, are, in many counties, of quite as much, and, in many instances, of decidedly more, actual interest, and economic and commercial value to the tillers of the soil. The minerals on his farm or unseated lands, whether coal, clay, iron ore, limestone or cement, are just as absolutely and entirely his property as the soil on the surface, the timber thereon, or the grain in his barn; and this argues, pertinently, to me, the importance and the direct advantage to the farmer of acquiring some knowledge of Practical or Economic Geology; especially, the aspects and the strata, thereof, that are exposed, in part, or may be found upon his own property and the formations in his own immediate district or county. It is true,—and I know whereof I affirm,—that ten thousand farmers,—and, indeed, a multiple of that number,—have been dispoiled of their valuable mineral deposits, defrauded of their coal, clay, iron ore, limestone, and what not, owing to the fact that they were deficient in knowledge of the geological surroundings and the mining aspects or mineral deposits at home, and were thereby easily deceived, relative to the actual presence or value of the same. The Geological Survey, from 1874 or 75 to 1895, was extensive and far reaching in its design, efforts and publications, and every county and district, so called, received a measure, if not a modicum, of attention and study, and a report, thereon, containing as much detailed and descriptive geology as was possible under the conditions attached and the means provided. But the appropriation of three quarters of a million of dollars, was really not more than a bagatelle; enough only for the real initiative of a complete and perfect Geological Survey and such as the importance of the State demanded and its citizen land owners deserve. The successive Legislatures, doubtless, with a proper spirit, but without the remotest conception of the actual work required or appreciation of its value and importance, in a commercial and utilitarian sense, made such meagre provision or allowance of money, that it was impossible for Prof. Lesley, great and capable as he was and a master mind in geology, to secure, in all instances, the most efficient experience and ability that the conditions required; and much of the work was done, hastily, and under such limitations of time and means, that the outcome, in many instances, was a misfortune and a calamity, I may say,—the undoing of a vast number of land owners who relied on such reports and maps, as were thus published, for guidance and information and which the several assistants of the survey, though well equipped, were fully aware could not be a certain or reliable guide in all localities, relative to the coal and other mineral deposits. My own experience was typical. In 58 or 60 days, I sketched the formations of two important coal counties, containing over 1,100,000 acres; while justice to these two counties, and to myself, indicated, that I should have had a "full" year for the construction of the map of each county. It was not possible to give a correct coloring of the coal areas and other formations, in so short a period, and with only $1,200 to defray all of the expenses, incident to the field work and completion of the said two maps. One most deplorable result of this defective work,—and I do not reflect upon the ability or integrity of any assistant engaged on the survey,—was, that vast areas of coal and clay lands were not included in the basins, as described in the reports or defined by the maps, or the actual height of measures was not indicated or the scope of the same accurately depicted; and, in a score of counties, the expert, or underling, employed by some autocrat of the coal trade or other designing speculator, found it most convenient and easy to dupe or mislead the farmer, or other land owner, by referring to the Geological Survey of his county, or the map and report thereon, and belittling his mineral deposits or denying their presence, on his lands, entirely, when the said expert knew that such minerals were there and of greater or less value. A farmer, ignorant of the coal or other deposits on his land, is induced to permit a driller, by direction of some capitalist, to take a core, with a diamond drill, from the formations on his farm; but the farmer is not permitted to see the core. It reveals to the driller, peradventure various coal seams, from 3 to 10 feet in thickness, not to mention good clay and iron ore, and the owner of the farm is apprised that there is no coal of any value, or over three feet in thickness, on his lands. He sells the whole right, thereof, for $10.00, $15.00 or $20.00 per acre; which would be barely one-tenth of its value, at that juncture, and very remotely so, when the railroad shall be located in that vicinity. After a lifetime of plodding, ploughing and toiling, on eight, ten or twelve inches of soil, in his later years, he is very many times robbed, cheated and lied out of his coal, clay or other mineral values; simply, because he has no means of knowing what might possibly be concealed in the rocks and slates of his farm. Is this not deliberate robbery? Or would it be any worse for me to enter your granary with your consent, measure one-half, one-fourth, or, even one-tenth of your corn, oats and wheat, and, upon this measurement, buy the entire crop or the actual contents of your grain bins? Is this not scientific stealing, of which we may study so many and various aspects in almost any direction, and do we not have here, in this "Grand Structure," an elaborate and gorgeous demonstration of stealing as an exact science? I have reported on 400,000,000 tons of coal on territory, supposed to be devoid of coal. Does not the real importance and necessity of learning something about Geology occur to you, who have given it no thought or study? As a science, it seems to be quite as obscure and remote as some indefinable aspects of religious superstition, with which, also, Geology seems to be associated in the minds of many people. Five millions of dollars, for a Geological Survey, would have been a meagre allowance and in no other sense, more so, than as a safeguard for the small land owner or those who have not big capital.

There are ethical and doctrinal phases of this subject and it is suggestive of many things, that appeal to your attention and reflection, in this direction, as well as in many others. You have, I may say an eternal, a perpetual suit in equity, perchance, in trespass, against those who thus infringe on your rights. In the moral features of this and other questions, remember you are not entirely segregated from other classes of your fellow citizens. The conservators of our best state and national interests, your rights must be admitted, and this deplorable inaccuracy of the Geological Survey, from which you have suffered as you have from bad politics and bad business, must convince you that it is due either to careless oversight or deliberate indifference on the part of those that could provide a remedy; while other departments have been accorded more favorable consideration in the Assembly. This dereliction has afforded opportunity to the designing schemer and speculator and you are mostly the victims. Every true science is progressive towards the betterment of all; but, apace and commensurate with these "fair sciences," is the science of commercialism, with all that it implies to the wise and which, were it estopped, how much better, in all respects, would be the Commonwealth. Verily, these things look like self seeking, evil design and financial craft gone to seed and money getting gone mad. The farmer, inherently and by association, is in favor of temperance, honesty in politics and business, patriotism, education, and every virtue that pertains to true manhood and true womanhood. He believes in more equitable and just distribution of wealth and wages; he is favorable to the church, and to the Commonwealth and to the United States as against any perverse or partisan control. He is utterly adverse to the saloon, autocracy, aristocracy, communism, nihilism, anarchism, the social evils, monopolies, the centralization of wealth, excessive and indiscriminate immigration and all the pernicious forces that have their genesis in the centers of population. He suffers, albeit, more from vicious methods and their incidental evils, than other classes. His power is known if only asserted. When patience ceases to be a virtue, forbearance becomes a crime; and of what avail is your moral force or influence, if it be latent, dormant and not a living, active agency,—more potent, as it might be, than any other that may be employed for universal good. The single abuse of privilege and advantage, in the direction of geological matters, as described, and by which you have been undone, for a quarter of a century, entirely justifies me in this digression. I submit, that the truest citizen, the truest farmer, the truest politician or statesman, the truest financier, the truest patriot and American, is the truest Christian.

Adverse comment on our great evils is not pessimism. Pessimism is error in its most repulsive and forbidding presentation,—cloudy, repellant, ominous. Optimism, so called, that connives at offense, condones sin and is sanguine and elated, even when evils are prevalent and almost all powerful; or is smiling and indulgent towards the destruction that seems imminent, is hardly better than avowed pessimism. In this respect, it is hardly less perilous than any other heresy that becomes extant or any other evil contagion that threatens. This view, as I entertain it, may not be roseate, or meet the approval of those who would extenuate these things; but it is reason,—a rational determination of conditions, and, as you have suffered deprivation and deception, "you millionaire farmers," so, also, you have the moral stamina and the intellectual status to rectify these perverse things, "these evils that so easily beset you," by harmony of action and effort. I know of no politics quite so pernicious, no stealing quite so systematic, no wickedness in high places quite so insolent, conspicuous, exemplary, or vicious, as here in Pennsylvania, and the record sustains the affirmation.

Some of the gods that we seemingly and, perchance, ignorantly worship, are the prevalent immoral forces which we see almost every day, in fulsome exhibition or disclosures.

Let these Penates be forgotten, the tutelar Deities be remanded to oblivion, and the social, financial and political gods, that we, or many of us, most adore, be set aside, discredited and repudiated, and rising from our obedience, before their broken and shattered altars, and in the light of our true faith, these same gods may become known and recognized only as the "Demons that we most despise."

GEOLOGY AS RELATED TO AGRICULTURE.

By W. H. Stout, *Pinegrove, Pa.*

Mountain, valley, hill and plain are features on all sides of us. Were it not for elevations and depressions the surface of the earth would be a monotonous plain, everywhere the same, the wealth of minerals inaccessible and the soil the same everywhere. Great convulsions, subsidences and upheavals, alternate periods of overflow and recession of oceans were the means of producing the conditions as we observe them.

Reckoning time and distance as we do in minutes, hours, days and years, distance in yards and miles we can faintly conceive what millions of years eons of time signify. This planet upon which we are destined to spend the few days allotted to us is on a wild career. Flying through space at a distance of eighty million miles from the ruling planet of our system, the sun, the earth is moving through the space at the rate of 19 miles a second, and spinning like a top in its revolutions at the rate of 17 miles per minute. We are certainly traveling at a rapid speed, possibly following other systems the same as ours, all holding their relative positions in the universe. We read and speak of the everlasting hills, but they are not so everlasting after all, since the elements are ever at work reducing them to lower elevations, so that thousands of feet of mountains were carried away. Heat, frost and chemical action are reducing by disintegration the solid rocks forming soil, some of which is constantly on the move by gravity, and through rivulets, streams and rivers, carried to tide water and the oceans. The deltas of the rivers and the coast line from Nova Scotia to the Florida Keys contain vast deposits swept from the continent among which is some of the best soil from our fields, so that by injudicious tillage we lose the finest, the best and most fertile of our soil.

Prof. Claypole in his Geology of Perry county, makes a calculation as to the amount of erosion and the material carried by flowing water.

"In ordinary weather a gallon of Juniata water carries about 8 grains of earthy sediment, or a pound for every hundred cubic feet of water, so that, 1,000,000 cubic yards of rock sediment is brought from Juniata, Mifflin, Huntingdon and Blair counties every year.

Twenty-five thousand feet of the deposit has been removed since the mountains were formed in that section. This is upon the assumption that the flow of water and the climate were the same during the period of erosion, it may have required five, ten or more millions of years to carry away five miles of mountain elevation." Thus changing from an Alpine condine to the present features the section drained by the Juniata River.

If then a comparatively small river removes such quantities of material we can conceive what a river like the Mississippi carries with its always muddy current which, it is estimated, carries annually a cubic mile of sediment to deposit near its delta, material composed of numerous formations through which it flows. The soil thus formed is among the most productive, and the overflow of the river renews the deposits periodically, forming a soil and conditions similar to the famous Nile Valley. The mixing of material from so many rock formations gives the soil the mechanical and chemical condition to produce the most productive soil. Much of the sediment deposited by the Mississippi River remains somewhat permanently at its mouth, near shore, shallowing the channel used for navigation, that New Orleans in danger of losing its shipping had Captain Eads construct a sort of hamper or wicker work from willow twigs, which were filled with stones and walled up in the bay, through which the water is forced in a channel used for shipping.

The U. S. Government only recently performed the same kind of work at New Orleans to prevent the channel from being silted so as to prevent vessels from entering and leaving the harbor. Although but a small proportion of vegetation consists of mineral elements derived from soil constant cropping year after year is a drain that exhausts the most productive land. It is calculated that in two crops, one of wheat and one of oats, grain and straw remove about 400 pounds of mineral elements, potash, soda, lime, magnesia, silicia and phosphoric acid from an acre of land. The U. S. Department of Agriculture, the various Experiment Stations and Boards of Agriculture perform a service of inestimable value, and we farmers usually accept their theories and teachings without question, but it should be recognized that even those of highest authority are not infallible.

A Bulletin issued by the U. S. Department of Agriculture by the Bureau of Soils, "Farmers' Bulletin No. 257," maintains that "All ordinary soils, including the so-called exhausted soils, contain sufficient plant food for good crop yields, and this supply will be indefinitely maintained, without the addition of any of the plant food elements." The application of fertilizers it is claimed does not usually add any plant food directly to the soil but acts rather as medicine to neutralize poisonous substances in the soil, the same as calomel, quinine, etc., are used for specifics in diseases. This is a theory not warranted by facts, yet some Institute speakers proclaim this theory before audiences of farmers, and it is likely to lead to serious mistakes.

We hear and read about abandoned farms in the Eastern and Middle states, in the older sections where farming has been practiced for several generations, and were it not that the fertile western plains furnish grain and feeds of various kinds; Germany supplies potash; Chili, Nitrate of Soda; Florida and Sicily, Sulphur; the Southern states, Phosphate Rock and Bones, with other slaughter house refuse, wherever obtainable, supply Nitrogen and Phosphoric Acid, substances that are not only stimulants but direct plant food; Agriculture would be less prosperous than it is. As westward the empire made its way, so followed exhausted farms, and were it not that the things enumerated were available, there would be many more abandoned farms and not alone farms but whole communities would be depopulated. The great and fertile plains were considered inexhaustible, commercial fertilizers were hooted at in many sections, and the farmers enriched themselves with the stores of plant food accumulated during past ages, but the soil is becoming less and less productive, so that even Kansas recently enacted laws governing the Analysis and Sale of Commercial Fertilizers in that state.

We have a great variety of soils of different ages and formations. much of it derived from the disintegration and redepositing by water action forming stratified rocks, composed of sand and clay, together with other elements. We have also soils organic in origin, derived from minute organisms, in the oceans, eozoon, globigerena, and corals, from the remains of which were formed mountains of limestone, and because of their organic origin and the mechanical condition of the soil derived from disintegrated limestone produces fertile lands throughout the world wherever limestone is found. There are also soils of vegetable origin, like coal, plumbago, etc., containing usually an excessive quantity of carbon not favorable for plant growth. Given a soil of reasonable depth with physical conditions, a proper proportion of sand and clay, neither too fine nor too coarse, it can, by the application of fertilizers and good tillage be made productive.

The little things, microscopic objects, play a very important part in agriculture, for while during ages past, races of people, vast numbers of animals and insects yielded their remains to the soil, the micro organisms have played a much more important part in soil production and soil physics than did those of a higher type of animal creation. We are in the midst of a most interesting section geologically, with the Silurian system largely between the Blue Ridge and the South Mountains, a bay of Mesozoic coming in at Hummelstown, the Devonian appearing about Rockville, the Carboniferous about Lykens, and the Permian higher in the series. Evidences of great climatic changes are in evidence in these sections, the eruptive or trap rocks in Adams, Cumberland, Lebanon, Lancaster and other counties, extending from Nova Scotia to North Carolina, the outpouring of molten material in a chasm of various widths, indicates a disturbance in the interior of the earth of vast dimensions and importance. The hills around Gettysburg, at Elizabethtown, Bunker Hill, also in Montgomery, Lehigh and Northampton counties yield a good road material, but not good soil.

The Devonian system termed the Age of Fishes, has soils in great variety, from fairly good to that of very poor quality. The Carboniferous in the Anthracite coal field has no soil worthy of the name, being composed of sand, clay and conglomerate rock unfit for cultivation. This is, however, a very important formation, indicating a period of tropical conditions when trees like the palms flourished near us and produced successive strata of coal and shale many feet in thickness, furnishing the best and only fuel of its kind yet discovered. Succeeding the Carboniferous, appeared the Glacial Age when as near to us as Catawissa and Berwick, masses of sand, gravel and boulders were brought from more northern sections and deposited on the surface overspreading the coal measures, with a mantle of till and debris of many feet in thickness, obstructing and changing the channels of streams in other directions, and producing during this period all the fresh water lakes north of the southern line of the Glaciated Area.

REPORT OF THE COMMITTEE ON CEREALS AND CEREAL CROPS.

By A. P. Young, *Chairman.*

In importance and value to the human race, the cereal crops stand preeminent. They furnish in one form or another, food for man and for the domesticated beasts that accompany him in all climes. They are susceptible of transportation and preservation for long distances and periods of time. Being less perishable, they furnish a ready means of relieving distress in far distant regions, brought about by failure of crops, or from any cause that may render the people destitute, of their usual food supply. In all ages, and in almost all parts of the world, destitution has occurred, famine sometimes carrying off large numbers of the human race. In these emergencies, the countries that produce largely of cereals have always been looked to for relief.

In this report we will not attempt to deal with all the cereal crops, nor to set forth the amount of production or value. These statistics, collected by the United States Department of Agriculture, and furnished by other good authorities, are accessible to all. The Department bulletins may be had for the asking.

The cereals in which we in Pennsylvania are most particularly interested are corn and wheat. From these we get our bread, and largely our butter and meat, as well. These crops take kindly to the soil and climate of all parts of the State, different varieties of the two grains adapting themselves to the environment remarkably. Our production per acre, low though it be, ranks well up toward the head in the table of production of the different states. Quality of both as raised here is equal to the best. When we compare, however, our average yield with the maximum crop produced, we become aware of the great need there is of bestirring ourselves to lessen the gap between the average crop and the highest yield possible. Many times the average yield fails to return enough to pay expenses of labor and seed.

There are many avenues leading up to better things. A few only can be enumerated here. Take corn first, since it leads in financial value. The seed is important. Is it fully adapted to soil and climatic conditions? Are the ears uniformly of good size with deep grains and small cob, well filled out? Does it produce an ear of fair size to every stalk? Or is it giving to producing many barren stalks, suckers and nubbins? There is certainly urgent need of improvement in ourseed corn. Go to a load of corn, or into a crib, and pick out a perfect ear. A single trial will convince any one that perfect ears are at least the exception, and not the rule. The crop of Pennsylvania the past season was millions of bushels short, mainly from preventable causes, not the least of which was poor seed. Seed corn should be selected early, thoroughly dried and protected from the damp atmosphere of winter thaws. It is not enough to dry it in the fall. It must be be protected from dampness, and the sudden changes that come along in our winters. To neglect in these particulars may be traced uneven stand, weak plants, some of the grains failing to germinate, others making a slow start, so that instead of being all in sight in a week or ten days at most, they come dragging along for a month, the last to get through being so discouraged as to produce a spindling, weak stalk and never an ear. In defining a weed, an eminent authority says it is "a plant out of place." If, by having too many stalks we fail to get ears, are we not tolerating weeds right in the corn hills? If there be four stalks where but three can come to perfection, is not the fourth stalk in its effect on the yield, a rank weed? A single additional grain on an ear, an ear added to a rod of row, will make many bushels in the aggregate crop of the State.

As to wheat, the Crop Reporter for January, 1908, discussing comparative yields for the past forty years says, "In Pennsylvania the difference in favor of the last twenty years is 2.1 bushels per acre;

in Ohio it is a little over half a bushel; in Indiana it is three tenths of a bushel; in Illinois, it is about one and a quarter bushels; in Missouri it is one-fifth of a bushel, and in Nebraska, as already stated, it is over two bushels, or nearly the same as in the old State of Pennsylvania. In the state last named the question of original fertility may be set entirely aside; and in periods of so great a length as twenty years, the effects of exceptionally good or bad seasons will be so nearly balanced that these too, may be left out of consideration.

"The figures for Pennsylvania may, therefore, be pretty confidently interpreted as a sign of substantial agricultural progress. The figures of several of the other states that show increasing yields, may be less convincing, but it should be remembered that such gains as stand to the credit of the last twenty years immediately preceding, have been in spite of the greatest discouragement that wheat growers have ever known; for the period from 1888 to 1907, inclusive, comprises many years in which the price of wheat scarcely covered the cost of production in the very states where agricultural practice is at its best, and where the most progressive farmers were to a large extent drawn into other lines of agricultural production."

So much for advancement in our grand old Commonwealth. But instead of a gain of a little more than two bushels in average yield in a period of forty years, we can in the next twenty years, by strict attention to business, with the assistance of the light that is coming from our Departments of Agriculture, National, and State, supplemented by our Board of Agriculture and Farmers' Institutes, nearly or quite double the yield of sixteen and six-tenths bushels with which we are now credited, if we will but make the best use of our opportunities. Every wide awake farmer realizes that we have been spreading over too many acres. The recent very low price for wheat and high price for labor has made it imperative that we produce more bushels from less acres, get more returns from less labor. Then, there is a great opportunity for improvement in kinds of wheat grown; many bushels may be added to our aggregate by sowing better varieties. Other bushels may be added by cleaning out foul seed. It is astonishing to see the extent to which cockle prevails in some wheat fields. Passing along the highway, or observing a nearby wheat field from the train, along in June the flowers are often frequent enough to make one think of a flower bed. It seems as though the time had come for a determined effort to be made to overcome the loss occasioned by foul seed. The ordinary wind mill won't clean it out. Cockle in wheat, smut in corn, are entirely too prevalent, and should not be tolerated to the extent that they now prevail.

To combat these and other pests, as well as to make a general advance along the whole line agriculturally, would it not be well for each township to maintain a seed farm for testing in search of best varieties, to disseminate clean seed, and teach better methods of cultivation? How about the Township High School or the Consolidated School? The towns are setting up shops, getting tools, teaching manual training, endeavoring to make their pupils adepts at trades, which is all right; but we can't all live as tradesmen. What is to hinder our setting up a School of Agriculture on a farm in connection with the Township High, or Consolidated School and making the pupil familiar with the mysteries of propagation, cultivation, fertilization, and all that will be necessary to make a finished agriculturist for the century in which we live, and from this center disseminate better varieties and clean seed as well as intelligent farmers?

REPORT OF THE LEGISLATIVE COMMITTEE.

In presenting this report at this time we deem it necessary to refer to a few things that have been accomplished in the past year, due, we believe, in a great measure, to the persistent efforts of this State Board by their endorsement and the sentiment they have created in favor of the measures, which we firmly believe will be the most efficient way of accomplishing what we want. For a number of years we advocated in this way giving greater privileges to trolley cars and for a two cent rate on our railroads.

Among the bills passed by the last General Assembly favorable to farmers we wish to name the new Feeding Stuffs Law, which is more stringent than its predecessor; the law requiring a chemical analysis of Paris Green and establishing a standard which it must come up to; the Meat Inspection Law, without which the Federal Inspected Meats from the West would have wiped out our Home Dressed Meat; The law requiring the wearing of metal tags by dogs on which license or tax has been paid, which is not stringent enough in our opinion; The Registration of Stallions, whereby we hope to get rid of the practice of raising poorly bred horse stock; The increased appropriation to the Department of Agriculture to be used for the destruction of plant diseases and insect pests; increased appropriation for Farmer's Institute work; also a larger appropriation for the Public Schools, etc.

We believe that the passage of the Act appropriating $500.00 to each county maintaining an Agricultural Fair for the purpose of increasing the amount of premiums paid on agricultural products exhibited will be of great benefit to the agricultural interests of the State, and the Legislature should be commended for the same.

In the last session an attempt was made to pass a bill requiring manufacturers of fertilizers to state upon the packages containing the same the sources from which the fertilizing ingredients are derived. This bill was vigorously fought by the largest fertilizer manufacturers of the State and Country, was passed without opposition in the House but failed to pass the Senate. We would recommend a renewed effort to pass this bill.

A bill was passed by the last Legislature by which the State was to pay for the betterment of our rural roads by appropriating fifty per cent. of the cost, but owing to the failure of the Senate to pass revenue bills the appropriation was not granted. We would respectfully recommend the same to our next Legislature.

We also commend the work of the State Highway Department for the good work that has already been accomplished in giving the farmers of the Commonwealth object lessons if nothing else in the work of good road construction, and very much deplore the fact that our Governor considered it his duty to cut down our appropriation for road building from $3,000,000 to $1,000,000, thus cutting down public road improvement very largely for the next year, or until the next Legislature makes appropriation for that purpose.

Also we express our approval of the Geiger Milk Law, which assures the farmers of this State a "square deal," in that he (the farmer) now receives his pay for every quart of milk sold, instead of as heretofore having to furnish 46 quarts of milk and only receive pay for 40 quarts. Formerly the farmer sold by dry measure, and dealer by liquid measure, but now both sell by liquid measure, thus making or establishing a uniform standard of milk measure.

Also the McGowan's Clean Milk Can Law, which calls for the thorough cleansing of all milk cans and other vessels shipped on railroads. Under penalty of $50.00 fine, no milk can now be returned by the receiver of milk, to the shipper of milk, unless thoroughly cleaned, which we regard as helpful in a sanitary point of view, as well of being of great value to the farmer.

We would also recommend an amendment to what is known as the Vaccination Law, placing the responsibility on the school board and not on the teacher, and placing the penalty for violation on the parent or guardian and not upon the scholar, as in many cases the result is that it deprives the child of half the term of school.

We would recommend an amendment to what is known as the State Road Law, wherein it provides for joint action of the State, County and Townships, and let the State take the whole responsibility of making the State Roads and distributing whatever money the State feels able to pay to the different counties in accordance with the miles of road in said counties, in a similar manner by which the school appropriation is distributed, which would be some relief to the overburdened taxation on real estate and would not be as complicated and would hasten the construction of our roads, for at present it takes months for all the parties to agree.

Believing that it is in accordance with the fundamental principles of our government that the majority shall rule, we also recommend the passage of a Local Option Law permitting the voters to decide whether the sale of alcoholic beverages shall or shall not be permitted in the communities in which they reside.

Your Committee are of the opinion that some legislation is necessary to make railroad companies, engaged in carrying passengers, give to the traveling public a "square deal." There are some railroad companies operating within this Commonwealth that, for the sake of being able to present to the public, time schedules that may appear more advantageous than those of their competitors, make their schedules so that the rule, and not the exception, is to be always late. Those wishing to travel must be at the station on time, and if the trains are habitually late precious time that might be devoted to business is lost. A law requiring railroad companies to pay a reasonable compensation for the time that passengers must lose in waiting for a train that is more than thirty minutes late, unless the company can show that the delay was caused by some unavoidable accident or unusual weather conditions, would go a great way toward remedying this evil.

There should be a law requiring bulletin boards to be provided at every station where an agent is employed, upon which shall be written a statement as to whether or not trains will be on time, and in case a train is late, a truthful statement as to how much late it is. Many times some one waiting for a train could, if he should know that it will be an hour late, leave the station and attend to some business or take a meal if near meal time, which he cannot risk doing if not informed as to the time when the train may be expected to arrive. Railroad companies should be required also to keep their ticket offices open long enough before the departure of each train to enable every one desiring so to do to purchase a ticket, and in every instance the ticket office should be open at least one-half hour before the departure of each train. Few things are more annoying than to be compelled to enter the rush that is sometimes made for the ticket window when, as is frequently the case on some special occasion, the waiting room is full of passengers and the window is opened but five or ten minutes before train time.

The condition in which waiting rooms and passenger coaches are kept in some sections of the State, especially on roads running between coal towns and other places having public works, at which foreigners are employed, is revolting. Railroad companies should be required to keep their waiting rooms and coaches clean and in proper sanitary condition.

In conclusion, Agriculture being the base of all property which is proven by all past History, we assert as follows:

Any nation that looks after the agricultural interests of the country has prospered on every hand, but, wherever the agricultural interests have been neglected, retrogression and downfall has been the result.

Therefore, in the opinion of this Board every effort should be put forth to foster our agricultural interests. Every dollar advanced for agricultural education will return an hundred fold. We believe that this end cannot be served better than to use every effort to promote the greater development of our State College, our Experiment Station, our Farmers' Institutes, Schools of Agriculture, etc., so that our State College, of which we are so proud, may yet "blossom as the rose" and favorably compare with our sister states, yea, place our grand old Commonwealth among the leading states of our Union.

A. J. KAHLER, Chairman,
HOWARD G. McGOWAN,
JASON SEXTON,
MATTHEW RODGERS,
S. S. BLYHOLDER.

SPECIAL REPORT OF LEGISLATIVE COMMITTEE.

WHEREAS, the Pennsylvania State Department of Forestry, in behalf of the whole body of citizens of the Commonwealth, has purchased, paid for, and now controls more than three-quarters of a million acres of land which it is now protecting and reforesting just so far and so rapidly as the means placed at its disposal will enable it to do; and

WHEREAS, this Department has established and is now successfully conducting one of the leading schools of forestry in the United States, wherein foresters are educated for exclusive employment upon the forest reserves of Pennsylvania; and

WHEREAS, the Pennsylvania Department of Forestry originated and for a period of five years successfully conducted the Mont Alto Open-air Camp Sanitorium for the treatment and cure of tuberculosis, from which small beginning has grown the present State-wide campaign against this disease, resulting in an appropriation of a million dollars for this work by the last Legislature; and

WHEREAS, there is immediate and pressing need that this Department of the State Government be afforded ample means for a more vigorous prosecution of the work with which it is charged:

THEREFORE, BE IT RESOLVED, that this organization approve the continued acquisition of large tracts of denuded non-agricultural mountain land for the establishment of forest reserves with the attendant resulting good to be derived therefrom.

RESOLVED, that this Organization approve the work done by the Department of Forestry in the treatment and cure of tuberculosis by the forest camp system, an innovation which was unpopular and antagonized at the start because not understood; but which has culminated in the splendid organized system of combatting this disease under the direction of the Department of Health.

RESOLVED, Further, that this Organization recommend increased appropriation by the next Legislature for education in practical forestry, the purchase of additional reserve land, and the growing and planting of millions of forest seedling trees where now the Department is able only to plant by thousands, to the end that our farms may be better watered, our mountain sides covered with timber, the destruction by fire prevented, and the general welfare of the Commonwealth augmented for the common good of the whole people.

RESOLVED, further, that this Department be accorded legislative authority to grow and distribute to farmers, either free or at cost as may be deemed most expedient, seedling forest trees, when this is accompanied by a reasonable assurance on the part of the distributees that they will be planted in accordance with instructions from the Department and that they will be properly cared for.

A. J. KAHLER, Chairman.
HOWARD G. McGOWAN.
JASON SEXTON.
MATTHEW RODGERS.
S. S. BLYHOLDER.

REPORT OF THE COMMITTEE ON ROADS AND ROAD LAWS.

By D. A. Knuppenburg, *Chairman*.

The State of Pennsylvania is now undergoing a complete change, not only in the matter of constructing roads, but also in the laws governing their maintenance. To say that there is no need of all this change would not be true. The road that answered the purpose so well one hundred years ago is not the ideal road of to-day. Conditions have changed, and we no longer seek the highest points in order to get hard ground for a road foundation, or pass some improved land, house or spot of cleared ground. We rather look for suitable grade, then build a road and let the people come to the road in place of covering every hill with a road. Men's views are changing and so are the roads.

There seems to be two ways of looking at the benefits to be derived from having improved roads. The point of view of the majority of farmers is that they are imposed upon by being compelled to make and maintain good roads for the exclusive use of the city man with his automobile. It has been said by the automobilists: "You farmers are cowards and more afraid than your horses." But even if it be so, have the farmers no cause to be afraid in view of the many serious and fatal accidents that are occurring almost daily throughout our State? A horse accustomed to automobiles in the city will scare at them in the country, and the farmers ask "What are we to do?" It is a fact that during the last two summers our old men, our wives and our daughters have been deprived of the use of public roads. Formerly they could drive to the towns to do their shopping and dispose of butter, eggs and small fruits, and visit neighbors. Now all that is changed. It seems, therefore, that the only way for country people to travel on the roads with absolute safety is to walk, and this is precisely what a rich automobilist suggested that they do. The automobilists drive over the roads merely for their own pleasure, while the farmers are obliged to travel on business. Again, the farmers are taxed heavily to keep the roads in good condition, and just at the season of the year when they could travel over them with pleasure and profit they are practically driven away by locomotives or rubber-tired wheels driven by careless and incompetent hands.

It is not our intention to take into consideration only one side of the question; this being a free country, the man with the automobile has rights that should be respected. We should also not lose sight of the fact that the manufacture, repair, and operation of automobiles give employment to many thousands of the working people. The automobile trade has reached the enormous sum of about $40,000,000 annually and has come in a very short time to a prominent position among the industries of our country. Further, there is a large amount of money distributed annually throughout the country by tourists, who, being usually people of wealth, are willing to pay, and do pay, generously for their entertainment while passing here and there throughout the land. This, of course, does not absolve automobile owners from their duty toward others. We believe the auto is with us to stay and we recommend that a tax be placed upon it that will be felt in the construction and maintenance of our roads. It is the lawless, reckless, heartless few who cause fear, suffering and death to so many. We therefore recommend more stringent laws governing the use of automobiles on our country roads. By the swift-moving wheels of the automobile the dust and small stones are lifted and thrown from the surface of the road, leaving it bare, rough and in need of repairs. (We refer to improved State roads.)

Road building in Pennsylvania is a great problem; we have no sooner solved one part of it than another, equally as perplexing, confronts us. The one to be attacked next is how to prevent the speedy deterioration of improved roads by the removal of the cushioning coat of screenings and dust which is needed to prevent the stone below from exposure to the grinding action of the wheels. This is an excessive damage caused by automobiles, and is too thoroughly established to admit of doubt. We find some roadbuilders viewing with a degree of alarm almost akin to consternation the suddenly increased cost of maintenance of their roads. Mr. Beman, of Harrisburg, Pa., in a paper read at Springfield, Mass., Sept. 24, 1907, said, "I believe that instead of a curse the automobile is a blessing in disguise, for I am firmly convinced that its coming will stimulate the search for a method of obtaining a dustless road. The ultimate result will be a road from which each passing breeze or each summer shower will not remove the fine particles of stone. The consequent enhanced durability will in the future reduce the cost of maintenance, even below that existing prior to the advent of the motor car, as there will be less rapid loss of material from the road surface than before the days of the automobile." About $60,000.00 revenue was received in 1907 from automobile licenses, which, if applied to roads, would not settle the dust.

We would like to call attention to loose stone being allowed to remain on our country roads. If the law could be rigidly enforced in regard to this, it would be of untold benefit to the public. Again, it the law could be amended so as to permit the use of crushed stone and a heavy road roller on country roads with State aid and supervision, an immediate and practical benefit to the masses would be the result.

We feel that the time is near at hand when the principle of State aid will be extended in its application so that the Commonwealth will assist in improving the condition of the ordinary dirt roads. In New York we find that the State is giving considerable aid to the dirt roads and we, in Pennsylvania, cannot afford to be far behind in carrying still further the State aid plan. We commend the State aid system of constructing high class stone roads, but believe that this is only a portion of the work which the Commonwealth will be found undertaking in the near future. In addition to the construction of macadam roads a system should be devised by which part of the burden now resting upon the townships in the care of dirt roads can be assumed by the State. The present State aid law in fact does take a small step in this direction in the provision contained in it by which the State Highway Department is required to furnish advice and information to township supervisors. We find that the Department has shown a disposition to interpret this section of the law in a very liberal manner, and that many townships in the State have been furnished free of charge by the Department, with working plans for bridges and culverts and with assistance and advice on many such points. State Highway Department engineers are sent without cost to the township to examine the sites of proposed new bridges in order to be able to give intelligent and proper advice and prepare plans for permanent structures. All of this work is a distinct advantage, apart from the actual improvements which are thus constructed. If at any future time the further improvement of a highway on which such bridges may be located may be undertaken, the expense then incurred will be lessened by the cost of whatever permanent bridges and culverts are now being built under the present system by which these plans are furnished without cost to the townships.

The use of wide tires should be encouraged in all possible ways and we would even favor legislation by which a gradual change from narrow tires to wide tires could be brought about. We of course could not favor legislation which would work a hardship upon the owners of narrow tires, but it would seem easy to devise a method by which the wide tire could be substituted for a narrow tire as the years go by until eventually we would find nothing but the wide tire in use. The benefit of wide tires has been too firmly established to admit of doubt in the mind of any person who has investigated this subject. It is true that there are still some who cling to their faith in the merit of the narrow tire, but their number is steadily decreasing and we must sooner or later reach a point where we can take another step in advance and do away forever with the narrow tire.

It has come to our attention that in some townships where improved State roads have been built the supervisors have neglected them to their serious damage. It is folly to suppose that a macadam road will never need any repairs. There is no implement which we use which does not need repairs at some time or other, and it needs no argument to show that the longer needed repairs are neglected the greater will be the expense involved when the repairs are actually made. It is folly to expend large sums of money in giving improved roads to a township if the men who are charged with their maintenance are so blind to the interests of their township that they do not keep the roads in proper condition. Such wilful neglect of their duty should be severely dealt with or some method devised by which necessary repairs will be made when needed.

We deeply regret that the bill passed by the last Legislature relative to the duties of township supervisors and the collection of road taxes failed to become law. It is not our purpose to attempt to consider all the features contained in that bill, but for our present purpose it is enough to say that it contained many features vastly superior to those of the supervisor law of 1905, and if it had been allowed to take its place on the statute books we believe it would have been hailed throughout the entire State as one of the most progressive and at the same time most satisfactory laws of recent years. Under this bill a nominal payment to supervisors was authorized so that they would no longer be required to give their services to the townships without compensation. The one dollar additional tax was also abolished by this bill and provision made by which the State was to pay in cash to the townships a sum equal to 50 per cent. of the road taxes which they collected. It is to be hoped that the next Legislature will re-enact some measure which will contain some of the features of this bill. Referring again to the State aid system of improving roads, we find that during 1907 there were completed about 200 miles, making the total length of roads improved by the State since the State Highway Department began its work in 1904 about 450 miles. We are informed by the Department that they have on file applications for nearly 3,500 miles of roads and that in order to build this amount the present appropriation will have to be increased fourfold or more. We believe that the Commonwealth can do no better with the millions which it annually receives than to expend a large portion of it annually in ways which will directly benefit so many of the common people of the State as does the improvement of its highways.

ADDRESS OF GOVERNOR EDWIN S. STUART.

I came in here to stay half an hour, but these discussions have proven so interesting that I will stay as long as I can. The last two papers have been very interesting to me as Chief Executive of this State. The agricultural interests of this State are entitled to the greatest credit. As far as the centre of our great industrial industries is concerned, they are the force that helps to make the great cities. The coal interest, and the manufacturing interest will, however, in time pass away, but the great agricultural interests we have always with us. As one of the gentlemen has said, the State that increases its agriculture increases its prosperity, and I am sure that holds true of Pennsylvania.

Now, as to the question of appropriations, I feel that when a man holds an official position, he must expect to have his official actions criticised by the people whom he represents, and at this time I represent officially the entire State of Pennsylvania, outside of any politics or anything else. Now, as to the question of appropriations: I know it is a great disappointment to communities and to those interested in the bills that come from the Legislature to the Executive for his signature, when he finds that he cannot grant that appropriation. But this question of appropriations is merely one of many that confront the Executive. It is merely a question as to whether there is enough money to carry it out. I did not intend to talk about this, but the last Legislature appropriated something like $71,000,000. It was rumored through the State that there was a surplus of $15,000,000, and I thought so with the rest, but I want to say right here that I don't believe in any great surplus in the State; any surplus there is should be used for the benefit of the people by whom it is contributed. I believe the keeping of so large an amount of money a just cause for criticism. I am not reflecting upon the Legislature; the Legislature—this last Legislature—has been, I think, as good as any Legislature the State ever had, but they sent to me appropriations approximating $71,000,000, and I then sent for the officers whom I have for the purpose, to inquire "what is the anticipated revenue for the next two years, so that I can base on it the bills I have to sign?" Instead of having a surplus of $14,000,000, while there was in the treasury $14,000,000, there were outstanding against it claims that included the school fund and Superintendents' salaries all over the State, amounting to about $7,000,000. In other words, the State was in the position of a man who, having in bank $10,000, has outstanding checks, not yet presented, to the amount of $5,000. We had a bank account of $14,000,000, but outstanding checks against it of $7,000,000—a trifling amount, but a very important one. After the officers told me that, I asked for the receipts of the next two years, including the $7,000,000, and I found it was between $46,000,000 and $47,000,000, and I was to sign bills appropriating $71,000,000. Now, it is only the exceptional business man who is allowed to overdraw his bank account. It might be desirable, but it would be unwise for the bank to allow it, and so, if I had the greatest inclination in the world, I could not sign those bills appropriating almost double our anticipated income for the next two years. I had to cut the appropriations and one of the bills cut in this manner was the good roads bill. Now, I believe that the road laws are one of the most important things in the country. One of the things the Executive has to consider in signing appropriations is the question of the greatest good to the greatest number. Now, there is nothing of more importance to agriculture than good roads, but you can't do it all in one year, nor in two years, nor even in three or four years. You go to England and Scotland, and you find good roads, but they were not built in a year, nor even in a few years; but it is the result of the effort of many, many years. It is the greatest interest to the common people that we must look for.

Now, as to the automobile, I don't own one, not because I don't like it, but because I feel that I cannot afford to own one. I suppose I am somewhat in the position of the young man of whom his father said "My boy has certainly succeeded in the automobile business." "Why?" said the other man, "I didn't know he owned an automobile." "Oh," said the father, "he don't, but he is the town constable, and he sweeps them in." I don't want to say anything against the automobile, but I do think they are very hard on State roads. When they run fifty or sixty miles an hour, usually the latter, they take a good deal of the road with them. Now, in New Jersey they certainly have fine roads, but they started fifteen or twenty years ago. And you must remember that Pennsylvania, in addition to building good roads, appropriates the largest amount of money to the public schools of any State in the Union. Now, when it came to a choice between the public roads and the public schools, I decided to cut the appropriation to roads. and let the schools stand, because the roads can wait until the boy is educated, if necessary.

The question of State matters is a new one to me, and while I am constantly learning, I have perhaps to-day learned more than I have in a long time, and I am willing to help anything that I can, not only in the matter of good roads, but in everything else. We are doing great things in Pennsylvania to-day. In addition to being the foremost State in the matter of appropriations to public schools, we are waging, as you know, a strong fight against tuberculosis, and that in itself is a great thing. It is not only the cause of large mortality in the human family, but it is the one thing that the farmers of our country have the most trouble with. To study and to fight this scourge, the State has appropriated $1,000,000, and if we can fight it, as I am informed by practical scientific men that we can do, it will be a wonderful thing.

I don't want to detain you any longer; I have talked longer than I attended. I will go with you hand in hand to make such appropriations as will be of interest to the farmers, and to the entire people of Pennsylvania. Another thing that comes to my mind is that we contribute more money to private charities than any other State in the Union. These are three great things to be foremost in: in our appropriations to the public schools, to the war waged against tuberculosis, and in the amounts appropriated for charities. But the question of good roads is coming up, and it will continue to grow, but I believe that it is better to build slowly and well; I believe it is better to build ten miles of good road that will last, than a hundred miles that will go to pieces in six months. And then there is another question comes up in connection with that. We can build the best roads, but they will go to pieces if they are not taken care of. Whose business it is to take care of them will have to be decided, as well as the question of the appropriation to build them. We must build the roads, and then find some one to take care of them.

REPORT OF THE COMMITTEE ON FERTILIZERS.

BY R. F. SCHWARZ, *Chairman.*

Your Committee on Fertilizers respectfully beg to report that while every effort which was thought to tend towards the getting of full information was made by your Committee, its report is not as full as it should be. One hundred and twenty requests for information, accompanied by paid return envelopes, were sent out to all the members of this Honorable Board, and to Institute managers, workers in the cause, and prominent farmers all over the State. Sixty-four replies were received and, be it said to the honor of this Board, fifty-three were from its members, while only eleven were received from parties outside the Board.

That the fertilizer question is regarded of great importance among farmers all over the State must be clearly evident to any one perusing the answers received by your committee, which answers are herewith respectfully submitted. Five questions were asked and answered by those replying and they were as follows:

About what amount of money was spent last year in your county for fertilizers? Definite answers to this query were received from but forty-three counties, these showing an expenditure of $4,824,000; but your Committee is convinced that, while these figures indicate an expenditure in the entire State of over $7,000,000, even this vast sum is an underestimate of the sum actually spent annually for fertilizers in Pennsylvania.

Is the use of fertilizers increasing or decreasing? Answers to this question show that in forty-three counties there was an increasing demand for fertilizers; in seven counties a decrease is reported, while in three counties the demand for and use of fertility in the bag seems to be stationary.

Is the tendency toward low-grade or high-grade fertilizers? This question was answered in forty-two counties for high and in twelve counties in favor of low grade, while two counties reported a stationary condition.

Do you think that the average farmer knows what he is buying when he puts his money in fertilizers? To this question forty-two counties answered "no," while five counties answered "yes," and the balance left the question answered.

Are you in favor of more stringent laws to protect the farmer in the purchase of fertilizers? The answer to this was almost unanimously "yes." The two answers of "no" were qualified by the statement, in one case, that there were too many laws already and only their enforcement was needed; in the other, that the only law needed was one making it compulsory on the farmer to study the fertilizer question.

From the answers received your Committee draws the following conclusions:

That by reason of the great amount of money expended for fertilizers in the State, it is the duty, and should be the constant endeavor of the Department of Agriculture to advocate and work for the passage of laws which will make the intelligent purchase of fertilizers possible to any farmer in our State. We fully recognize the fact that no law or laws will be of use or help to that unfortunately too large class of farmers who simply take the word of the agent from whom they buy and pay their money, or promise to pay it, without looking at the analysis of the bag they buy. While this analysis reveals only the commercial value, and not the plant food value of the contents of the bag, it is at present the only guide the law provides for.

Your Committee would suggest to the Department that the laws and requirements of the State of West Virginia, where affidavits are required to be filed by the manufacturers as to the source and degree of solubility of ingredients, and where all agents or dealers are required under penalty to send copies of their orders for fertilizers to the Director of the Experimental Station, are worthy of study. The Experiment Station there issues to the manufacturers tags on which is printed the analysis, etc., as contained in the affidavit filed, and when goods do not come up to the sworn statement, the manufacturer may be prosecuted for perjury. The Experiment Station charges forty cents per ton of fertilizer for the tags.

The law of Kentucky might also prove an interesting study, and your Committee particularly points to that part of the fertilizer law of Indiana which provides for printing of tags by the State Chemist, which tags are required to show only the minimum concents of fertility, thus doing away with the foolish, misleading figures allowed by our Pennsylvania law.

The practice at the Virginia station of publishing the solubility and probable plantfood value of all known ingredients of fertilizers is one the Committee would recommend for adoption by the Department of Agriculture of Pennsylvania. Such statement could easily be included in our present fertilizer bulletin.

We would also recommend that the analyses in Pennsylvania be made to conform to those of New Jersey, by requiring the State Chemist to reduce the temperature of the Citrate of Ammonia used to 100 degrees instead of 150 degrees Fahrenheit, as now used; this because analysis obtained by the use of the lesser temperature will and do more truthfully show the plant food which can really be made available to the growing plant.

Your Committee has been able to gather but little information as to the use of Floats, or simply ground concentrated Phosphate rock, but believe that the evidence so far at hand does not justify us in advocating their use in Pennsylvania soils, except where such soils contain ample stores of humus.

While your Committee realize that it is not possible to obtain all we ask for to safeguard the farmer, we would name the following points as of special importance in any new law:

First: Prevent the printing on bag or tag of all but plain minimum figures.

Second: Provide for some statement on bag or tag of the source of ingredients in the fertilizer, or at least for the establishment of some standard of solubility by the use of which the tag can show various degrees.

Third: Provide for an increased penalty for non-compliance with the law. The minimum fine of $25 and possible maximum of $200 does not seem sufficiently severe.

Fourth: Provide that the official analysis made by the State Chemist shall be sufficient legal evidence of the infraction of the law, where such analysis shows less value than the guarantee.

So far as your Committee are aware, no prosecutions for infractions of the present law have been brought, even though the last bulletin shows that during the period it records ninety-seven brands fell below the guarantee in Phosphoric Acid, one hundred and thirty-eight brands fell below the guarantee in Potash, and one hundred and thirteen brands fell below the guarantee in Nitrogen contents. Your Committee respectfully submits these facts for consideration. Knowing of the activity of the Department in the prosecution of violators of the Food and Foodstuff laws, we feel that some valid reason must exist for the immunity enjoyed by the dishonest fertilizer manufacturer.

AGRICULTURE IN SECONDARY SCHOOLS.

By Dr. Thomas F. Hunt, *State College, Pa.*

It is well to remind ourselves at the very outset that the most important problem in secondary education is not primarily the subject or subjects taught. If out of every ten pupils who enter the public schools only one enters the High School, it must be obvious that the question of first importance is not whether this or that subject should be taught or whether one kind of education is better than another, but the prime question is how to reach the nine boys and girls who now fail to receive the benefits of secondary education.

Two important factors in bringing about this result are inspiration and facilities. Education is dependent upon both ideals and opportunity. Going to a high school and later to a University was with the speaker merely a matter of accident or a chapter of accidents. Such educational resources were beyond the horizon of himself and his schoolmates. On the other hand, the idea of not going to college never seems to have occurred to his son as an educational possibility. To him and his schoolmates, raised in a University atmosphere, a college education is as much a part of their educational ideals as the sun is a part of the solar system.

Of course with inspiration must go opportunity. It goes without saying that as far as possible every boy and girl is entitled to equal educational opportunities. The greater the opportunities, moreover, the greater will be the inspiration and the demand. It is for this reason that higher education grows like a snowball. The larger it becomes the more snow it gathers.

This much has been said in order that in the discussion which follows on agriculture in the secondary schools the wrong emphasis shall not be put upon the subject. The purpose of schools is not to teach subjects but to teach boys and girls. Subjects are incidental to so training boys and girls that they will be able to live the fullest possible lives. When I look over a group of educated men, say for example a college faculty, and reflect that no two of them were trained alike, that in many cases the kind of education has been as wide apart as the north and south poles, although the amount may have been substantially the same. I am compelled to conclude that it is not essential that men and women should pass through the same educational cider press in order to succeed in life or to be of the highest service. It also gives me quite a different view concerning entrance requirements. But that is another story and to discuss it here might lead us astray. All that is needed to be said here is that we need to inspire boys and girls with a desire for knowledge and culture and not put unneccessary difficulties in the way of their obtaining it.

Says President Roosevelt, in his speech at the fiftieth anniversary of the founding of the Michigan Agricultural College:

"Book learning is very important, but it is by no means everything; and we shall never get the right idea of education until we definitely understand that a man may be well trained in book learning and yet in the proper sense of the word and for all practical purposes be utterly uneducated; while a man of comparatively little book learning may, nevertheless, in essentials have a good training." Every student of education knows this is true, but I sometimes think some of us do not give it time to soak in. It is not the purpose this afternoon, therefore, to consider the desirability of teaching agriculture and related subjects in high schools and other secondary institutions, but to study the evolution of this movement as a basis for discussion the best method of introducing agriculture into these schools in Pennsylvania. Dr. Schaeffer has said there are 301 township high schools in Pennsylvania and that agriculture must be placed in every one of them. How may this best be accomplished? How can we get down to business?

The Land Grant Act of 1862, which provided for the teaching of agriculture and mechanic arts, established in each State a college. When this act was passed, the term college had a definite meaning. which clearly differentiated it from an academy. Notwithstanding this fact, however, a number of the colleges in this country have been so far as their entrance requirements are concernd, little or none above those of secondary schools. Such colleges have had a greater number of teachers and larger facilities, especially in the way of laboratories, than those possessed by ordinary high schools.

That they have done a somewhat higher grade of work than is possible in an ordinary high school is probable. Neither criticisms nor comparison is here intended. The point is that for many years secondary education in agriculture has been an accomplished fact in this country. Almost all the agricultural colleges have recognized the demand for secondary education by permitting students with less than college entrance requirements and sometimes without entrance requirements of any kind to enter and take such studies in agriculture and allied branches as their previous training would permit. In some instances the students have entered the classes with regular students and in other cases separate classes have been organized. Not infrequently such students subsequently make up their entrance requirements and graduate. Some of the best men the colleges have turned out have been of this class.

Not only have students been permitted thus to pursue studies throughout the year, but in most institutions winter courses, usually varying in length from eight to twelve weeks, have been organized. These courses have usually been very much specialized, students often giving their entire time to some branch of agriculture as dairying, poultry, husbandry, etc. The pioneer in this work was the University of Wisconsin when, in 1890, Dean Henry organized the first winter course in dairying. While it is true that pumpkins can be grown in three months and oak trees require thirty years, it is also true that these winter term courses not only give useful knowledge and much inspiration but also have pedagogic value when in the hands of real teachers.

The following testimonials are not without interest in this connection.

"I owe my success to the Short Course, and I doubt whether I would be on the farm to-day had I not taken that course."

"The Short Course has increased my earning capacity 25 per cent."

"We consider the time spent in Madison at the Short Course as two of the best spent winters of our lives."

"Farm work is much more interesting to me since taking the Short Course in Agriculture. Work that was once a drudgery is now a pleasure."

"I feel that the money spent in the Short Course is the most profitable investment I have ever made."

"We have added from 40 to 45 per cent. to the production of our farm by practicing a thorough system of crop rotation. I have learned how to care for live stock, and we have increased our number 25 per cent. and the quality of our animals 60 per cent. Our dairy herd produces easily 50 per cent. more than it did before I took the Short Course."

"I am unable to express the value of the general surroundings and environments of the University, and habits formed while there. The longer I am away, the clearer do I see the results. The cost is trifling when I spread it over my life, as the advantages obtained will always remain with me."

It should be noted here that the students in the short winter courses have not generally been persons of high school age, but have been older students often with some high school preparation. We must, I think, recognize age as a factor in mental development entirely aside from scholastic training.

Professor Henry says: "The short course is not successful with young men under 20 years of age and those who have had no practical farm experiences. But it succeeds splendidly with boys who have completed the district school work and who have been partners, as it were, with their fathers in farming or who have actually run farms themselves. There is all the difference in the world between lads who have never had any care or responsibility in their lives and those who have carried such responsibility."

The next step in the evolution of secondary instruction in agriculture was the organizing of definite separate secondary schools within the agricultural colleges themselves. The first separate school of this type was organized in the University of Minnesota and is known as the Minnesota School of Agriculture. This institution offers a three years' course of six months each, November to April inclusive, thus enabling the boys and girls in that state of long winters and short summers to be on the farm during the greater part of the growing season.

The school was established in 1888. The total attendance in the regular course in the school since its opening has been 4,283 students not counting any duplicates. There have been 870 graduates, of whom 197 were young women.

Special industrial schools have been established in several states as in Alabama, Georgia, Maryland, New York, and Wisconsin. These schools place principal emphasis upon instruction in agriculture, manual training and home economics, while the ordinary high school subjects, as such, are made incidental. Perhaps the most important schools of this type are those in Wisconsin. In 1901 the Legislature of Wisconsin enacted a law authorizing counties to establish secondary schools of agriculture and domestic economy and providing that the State shall pay each county maintaining such school a sum equal to two-thirds the amount actually expended for maintaining such school during the year, provided that the total amount so apportioned shall not exceed $4,000 to any one school in any one year.

In 1902, two schools of this class were established, one in Menomonie, Dunn County, and the other in Wausau, Marathon County. Students are admitted directly from the rural schools. The regular course consists of two years, of eight months each. The tuition is free to students of the county. It is reported that there was a good attendance at the opening of each school, which has steadily increased each year.

This movement for specialized secondary industrial schools, including agriculture, mechanic arts and domestic or household science, has attracted widespread attention. Besides being under consideration in several State Legislatures, there was introduced January 22, 1907, in the National House of Representatives, by Congressman Davis, of Minnesota a bill (H.R. 2,475), to provide an annual appropriation for industrial education in agricultural high schools and in city high schools, and for branch agricultural experiment stations.

The bill provides for an appropriation "to each State and Territory for the maintenance of instruction in agriculture and home economics in agricultural high schools of secondary grade and instruction in mechanic arts and home economics in city high schools of secondary grade a sum of money equal to ten cents per capita of the population of each State and Territory." The bill further provides that the funds thus appropriated shall be used only for instruction in agriculture, mechanic arts and home economics, and that all states and territories and all schools accepting these funds shall provide other funds with which to pay the cost of providing the necessary lands and buildings and of instruction in all general studies required to make well-rounded high school courses of study.

The bill further provides that each agricultural high school may maintain a branch experiment station for each of which the federal government will appropriate annually $2,500. provided the State Legislature appropriates an equal amount.

It will be seen that if the State of Pennsylvania has a population of 6,000,000 that this means a federal appropriation of $600,000 annually for secondary education in agriculture, mechanic arts and home economics, to say nothing of the money appropriated for the branch experiment stations. In addition money must be provided by the state or otherwise for the necessary lands and buildings and for the instruction in all general studies required to make well-rounded high school courses of study.

The significance of this bill may be best realized by giving a brief account of what the federal government has done heretofore for agriculture and mechanic arts.

In 1862 the first Morrill Act was passed, apportioning to each State 30,000 acres of public land for each Senator or Representative in Congress to which the states were respectively entitled, for the endowment, support and maintenance of at least one college. This apportionment was, therefore, in proportion to the population of the several states. Pennsylvania derives $30,000 annually from this Act. The second Morrill Act passed, in 1890, appropriates $25,000 annually to each state, and the Nelson Amendment, passed in 1907, adds $5,000 annually, and this amount until it reaches $50,000. The Hatch Bill, passed in 1887, establishing the experiment stations, appropriates $15,000 annually, while the Adams Act passed in 1906, added $5,000, and to this amount will add $2,000 annually until the amount reaches $30,000.00. The total appropriation from the federal government for higher education and for the Experiment Station in a few years will amount to $110,000, while the appropriation for secondary education will amount to $600,000 or $700,000 annually should the Davis Bill become a law. It will be noted also that all these appropriations except in the case of the first Morrill Act, make the same appropriation to each state without regard to its size, wealth or population, but the Davis Bill, like the first Morrill Act, apportions the money in accordance with the population of the several states. That we may better understand the full significance of such apportionment it may be pointed out that the people of Pennsylvania, assuming they are average people in their consuming power, are contributing to the support of the national government about $80,000,000 annually. Pennsylvania contributes annually about $15,000,000 to the support of the Army and Navy, or more than half as much as the cost of the whole State government and twice as much as the State appropriation to the public schools. Twice as much for national welfare as for State education.

This bill differs from the Morrill Acts in another way. The first Morrill Act provides for the teaching of scientific and classical studies and military science. The second Morrill Act provides for instruction in the English language and the various branches of mathematical, physical, natural and economic science. The report of the Commissioner of Education for year ending June 30, 1905, shows the expenditure of the federal funds of the Land Grant Colleges to be as follows:

Agriculture, 16.8.
Mechanic Arts, 29.6.
English Language, 12.4.
Mathematical Science, 11.8.
Natural and Physical Science, 23.2.
Economic Science, 6.2.

The Davis Bill provides, as previously stated, that the federal funds appropriated for secondary education shall be used only for instruction in agriculture, mechanic arts and home economics, while the instruction in all general studies required to make well-rounded high school courses of study must be provided from other funds.

While this movement has been going on for specialized secondary agricultural or industrial schools, another movement has been in progress looking to the introduction of agriculture into high schools substantially as they exist to-day. The persons who are agitating for secondary education in agriculture may be divided into three classes: (1) those who favor the specialized industrial or agricultural high schools as above-mentioned; (2) those who do not believe in agricultural high schools any more than they believe in Algebraic High Schools or Botanical High Schools, but who believe that agriculture is a subject which may be taught in any high school to any student, just as Latin, or geometry, or physics may be taught; (3) the third class are those who favor both classes of schools, namely, the specialized agricultural high school with a trained faculty of experts, and the ordinary high school with agriculture taking its place with other subjects.

The argument with some is that the specialized high school is a phase of our educational development and is necessary for the purpose of creating interest and enthusiasm and for the purpose of working out satisfactory systems of instruction; that when these special schools have demonstrated their usefulness and place in the educational system, then the ordinary high schools of the country will adopt such form of instruction as has been proved best adapted to their needs.

It is a mistake to believe that the same system of education will work equally well in all places. What may be best for Georgia or Minnesota may not be best for Pennsylvania or Massachusetts. I hold, however, that any system of education is faulty which does not permit boys and girls between the ages of 14 and 18 to sleep at home. At that age the boys and girls not only need their parents, but what is perhaps no less important, the parents need the boys and girls, and any system of education which looks toward the breaking up of the home life at these ages cannot be looked upon as ideal. What is needed is a high school within sleeping distance of every boy and girl of high school age in the state. In each of these high schools every boy that wishes to do so should be able to get some knowledge that will fit him directly for performing successfully the most important duty of every man, viz., earning his daily bread, and every girl should receive training in home economics whether she wishes it or not.

It is high time that we abandoned that educational ideal that there is something unclean in preparing a boy or girl to earn a living. One of the greatest college Presidents of this country recently said: "The educated man who cannot earn his own living is not worth his education." President Roosevelt in the address to which earlier reference was made said: "No one can look at the peoples of mankind as they stand at present without realizing that industrial training is one of the most potent factors in national development."

"By the tariff and by our immigration laws we can protect ourselves against the competition of pauper labor here at home; but when we contend for the markets of the world, we can get no protection, and we shall then find that our most formidable competitors are the nations in which there is the most highly developed business ability, the most developed industrial skill; and these are the qualities which we must ourselves develop."

Although perhaps less progress is being made in the introduction of agriculture into existing high schools than in the establishment of specialized agricultural high schools, yet some progress is being made. Dean Price, of the Ohio State University, states that about fifty high schools in Ohio have introduced agricultural instruction.

One difficulty with the introduction of agriculture into the high school has been that high schools prepare students for college instead of for life, and although the smaller part of them go to college, the students themselves have insisted upon subjects which would permit them to enter college. In New York, the State Education Department has met this situation by announcing a syllabus on agriculture upon the completion of which regents credit is given as for any other subject. This syllabus is designed to occupy three periods a week throughout the year, and it is recommended to be given in the sophomore year, following the course in biology in the freshman year. As far as I know, no high school in New York has introduced this syllabus into its curriculum. Among other reasons, doubtless, on account of lack of teachers to teach the subject. This brings us to the question of how this subject is to be taught if introduced into the high school.

In 1895 the Association of American Agricultural Colleges and Experiment Stations appointed a committee on the methods of teaching agriculture. This committee has made annual reports to the association covering various phases of agricultural education. The seventh report is on secondary courses in agriculture in which the committee shows that agricultural courses may be offered in the high schools without any violent or radical reorganization of existing programs for such schools. A number of existing high school programs in different parts of the country were studied, and a tentative agricultural course for a number of these was suggested. The following, selected from the number is a simple form of high school course prepared under the direction of the State Superintendent of Public Instruction in Indiana and recommended for use in that state in high schools where at least two teachers are employed in high school work exclusively. Running parallel to this course the committee has prepared a tentative agricultural course, which presupposes an additional teacher.

PROGRAM FOR HIGH SCHOOL IN INDIANA.

FIRST YEAR.

General Course.		Tentative Agricultural Course.	
Algebra,	5	English,	5
English,	5	Algebra,	5
Latin,	5	Plants and their cultivation (i. e., botany, general and economic),	5
Physics or chemistry,	5	Physics,	5

SECOND YEAR.

General Course.		Tentative Agricultural Course.	
Algebra (one-third year),	5	English,	5
Geometry (two-thirds year),	5	Algebra,	5
English,	5	Geometry,	5
Latin,	5	Animals and their management (i. e., zoology, general and economic),	5
		Chemistry,	5

THIRD YEAR.

General Course.		Tentative Agricultural Course.	
Geometry (two-thirds year),	5	English,	5
Elective† (one-third year),	5	Geometry, Latin or German,	5
English,	5	Agronomy (with special attention to local crops),	5
History,	5	History,	5

FOURTH YEAR.

General Course.		Tentative Agricultural Course.	
Elective,†	5	History,	5
Zoology or botany,	5	Political economy,	5
Latin,	5	Zootechny and dairying,	5
History,	5	Latin or German,	5

*With each subject, the number of recitation periods per week is given.

†Mathematics, physical geography, oratory, or advanced physiology.

The question is not whether either of these courses are perfect or even logical, but whether it is possible to introduce into existing programs of recognized standing, agriculture instruction without a radical departure from existing conditions.

It was suggested by the Committee that with the introduction of agriculture into high schools of this kind, the division of studies among three teachers might be as follows:

A. English, Latin and German.
B. Chemistry, Botany, Zoology and Agriculture.
C. Physics, Mathematics, History and Political Economy.

The Committee further states that Teacher B should be an Agricultural College graduate and would ordinarily be a man who might be principal of the school, while teachers A and C would ordinarily be women.

Concerning the value of the instruction the Committee has this to say:

"Whenever the manual arts or the natural sciences are largely introduced into high-school courses the practical effect is to reduce the amount of time given to the ancient and modern languages. With improved instruction in English and science the effect of this on the general training of the student is not as marked as it might otherwise be, and whatever the theoretical pedagogical value of instruction in ancient or modern languages, there is little doubt that when a choice has to be made between these subjects and those which relate directly to the pursuit by which the pupil is to gain his livelihood, it will in most cases be desirable that he shall choose the things of most direct benefit in his life work. That it will not always be necessary for the student of agriculture to entirely neglect the study of at least one ancient or modern language in this high-school course, provided his tastes or attainments lead him in that direction, may be seen from examination of the programs of courses presented herewith."

"This is believed that the presentation of schedules as above justifies the assertion that it is entirely practicable to adjust an agricultural course of high-school grade to existing high-school schedules and to make this agricultural course fairly satisfactory for the purposes of general training, as well as elementary instruction in the theory and practice of agriculture. The graduate of such an agricultural course may fairly be expected to understand the scientific basis of improved agriculture and to have an intelligent appreciation of the needs of a progressive agriculture. He will then be in position to profit by the results of the investigations of the experiment stations and by the information regarding the progress of his art which may come to him from the more intelligent of his neighbors, farmers' institutes, and good books and journals. He will be likely to become an intelligent and progressive farmer as well as a refined and useful citizen and home-maker."

The Committee on Methods of Teaching agriculture were, however, painfully aware that if progress in the introduction of agriculture in high schools was to be made, the subject matter must be put into pedagogic form adapted to the needs of the high school pupils. This has been done in some measure by the preparation of two syllabi. One is entitled exercises in elementary agriculture with a substitute plant production, written by Dick J. Crosby, and the other is entitled a syllabus on Agronomy for Secondary Schools, written by Professor G. F. Warren. These are intended as laboratory guides or manuals for the use of the teacher and not as text books to be studied by the pupil.

The pamphlet on elementary agriculture consists of 54 exercises on such subjects as

How roots absorb moisture.
To show that plants get food from soil.
To show the rise of water in plants.
How plants grow.
Seeds, germination test; purity test.
To show how young plants get food from seeds.
To make soft cuttings; hard cuttings.

Cleft grafting, whip grafting; budding.
Conditions essential to plant growth, light, heat, moisture, air.
Classification of soils.
Air in soils.
The effect of lime on soils.
Temperature of soils as affected by color.
The influence of tillage and mulches on the retention of moisture in soils.
Influence of drainage upon plant growth.
Selection of seed corn.
Field study of loss from poor seed corn.
The feeding value of corn.

This report was prepared primarily for distinct schools below the high school grades, but in many parts of the country, especially in the South, this set of exercises might well find a place in high schools of the more elementary type.

Your attention is next called to the syllabus on Agronomy for Secondary Schools. If the tentative agricultural course which has been presented be examined it will be noted that this course provides for instruction in botany and physics in the first year; zoology and chemistry in the second year; agronomy in the third year and zootechny and dairying in the fourth year. Since these terms, agronomy and zootechny, are comparatively new, it may be well to pause here long enough to give a few definitions. Agriculture may be defined as the science and art of producing living things. There are two classes of living things, namely, plants and animals. The science and art of producing plants is, therefore, agronomy, while the science and art of producing animals is zootechny or animal husbandry. Botany studies the fundamental laws of plant growth: agronomy studies the economical application of these laws. Zoology in like manner classifies animals: zootechny studies the production of those useful to mankind. It is obvious that much of the usefulness of botany and zoology will depend upon the point of view from which it is taught.

Referring again to this tentative course in agriculture it will be seen that this syllabus on agronomy is intended to cover the crop producing side of agriculture and may occupy a year of study throughout the year, preferably, perhaps the junior year, in order that the student should have first studied botany, chemistry and physics. Of course I am aware that here is opportunity for endless discussion, but order of subjects is not an essential part of this discussion, and in any case I am convinced that the order of subjects is not a cast iron matter and that much depends upon the point of view with which the subject is presented.

The syllabus on agronomy is more than a syllabus; it is a set of daily instructions to the teacher. It tells the teacher whether on a given day the exercise is to be a recitation, a demonstration lecture, a laboratory exercise or a field excursion. It gives a brief outline of the subject matter and refers the teacher to bulletins or books containing the subject matter in question. If a demonstration lecture or a laboratory exercise it states precisely the maaterials and apparatus required.

This syllabus recognizes four kinds of exercises, namely, recitations, demonstration lectures, laboratory exercises and field excursions.

The following is a sample of the field excursions:

10 (3) Field Lesson. Relation of crops to types of soil, plant roots, nodules on legumes. Materials. Rule, spade.

(a) Go across several farms. Notice what kinds of crops are being grown on sandy soils, on clay soils on wet land. Some crops can be raised on a great variety of soils. Thus, timothy hay can be grown successfully on clays, clay loams, and loams, or even on fine sand, but it usually does best on the clay or clay loams. Peaches usually thrive best on fine, sandy soils. White or Irish potatoes require a loose, moist soil for their best development. To what extent are the crops varied with the kinds of soil in your region?

(b) Dig down beside a cornstalk; notice how deep it is to the first roots; to the deepest roots. Repeat in several places and on different kinds of soil, if possible. How deep could a cultivator go without hurting the roots? Similarly, find the depth and lateral extent of roots of clover and other crops. As the roots decay they add to the humus and make the soil more productive. What plant roots examined would tend to deepen the soil and be most valuable as they decay?

(c) Carefully dig up a clover plant; look for nodules on the roots. Bacteria live in these nodules. By means of these nitrogen is taken from the air in the soil and is made available for plant use. Nitrogen is one of the most important foods for plants. It is the most expensive part of common fertilizers. Only members of the pea family (legumes) are capable of thus getting nitrogen. Why does clover benefit a crop that follows it? Consider the depth and amount of roots as well as the nodules. Dig any of the following or other legumes that you see and look for nodules: White clover, sweet clover, beans, peas, vetches, alfalfa, etc. Later lessons will consider this topic again. (Farmers' Bul. 215, p. 15; Experiments with Plants pp. 133-135 and 149; Physics of Agriculture, pp. 150-157.)

Then follows two recitations covering this subject.

Next a laboratory exercise is selected for illustration which reads as follows:

60 (a) Laboratory. Study of the spike of wheat.

Materials. Heads of two or more varieties of wheat. The following are suggested: Dawson's Golden Chaff, a soft white winter; Fultz, a red winter; Turkey, a hard winter; Fife, or blue stem, a hard spring; Durum, a macaroni. The spikes of wheat should be laid between pieces of moistened blotting paper for several hours before handing to students, in order to toughen the parts.

Request each student to report the following, after examining a head of wheat:

1. Number of spikelets in the spike of wheat.
2. Number of flowers in each spikelet.
3. Number of grains in the whole spike.
4. Determine the number and arrange weight of grains occupying first, second, third and fourth place from rachis.
5. Number of empty glumes in a spikelet.
6. Make a sketch of the beak, shoulder, and auricle of the empty glume.
7. How does the flowering glume differ from the palea?

8. How is the spikelet attached to the rachis?
9. Draw the rachis.

(Cereals in America, pp. 31-33.)

The laboratory exercise is followed by a recitation in which it is sought to develop the purpose of this exercise.

Lastly an illustration of a demonstration lecture is given.

51 (2) Demonstration. Germination test of corn. Materials. Ten or more ears of corn.

Perform the test by the method given in Farmers' Bulletin 243, page 8. In this manner test seed for farmers in the community.

This is followed by a recitation on the germination of seed corn in preparation for which students are required to study Farmers' Bulletins 229 and 253.

It will be noted that in each of these cases the recitation does not precede but follows the exercises in which the student is taught to observe and reason for himself.

I once had a class in what is known as Animal Mechanics. Instead of assigning a lesson in a text-book, without any previous preparation I took the class into a room where there were some horses and two pairs of scales placed side by side in such manner that the front and hind members of the horse could be weighed separately but simultaneously. The students were requested to determine these weights and calculate the position of the line of gravitation. Then they placed the front feet of a horse on a box so as to represent the horse going up hill or the hind feet on a box to represent him going down hill, and determine whether the line of gravitation had changed. After one of these students had been working for an hour or so, he came to me and said: "I must have made a mistake, I do not find that the line of gravitation has been changed." "Well," I said, "if you found it to be so, it must be so." With that easy, confidential air that a student will often assume toward his instructor in field excursions or laboratory exercises, the student said: "Professor, are you trying to string us?" "No," I laughingly replied, "I am not trying to string you. I am trying to get you to determine the facts. To-morrow I will explain to you the reasons for the facts." A half hour later the same student came to me with a correct explanation of the facts which he had thought out for himself. I could have given the facts and explained the reasons for them to the whole class in fifteen minutes. But the information would have been my information. In two hours the student had determined for himself the facts and thought the reasons. The information was no longer mine; it was his.

But, you may say, as others has said, that no teacher short of an agricultural college graduate is prepared to teach this syllabus, and that there are not enough agricultural college graduates to man the high schools of the country even if they had the inclination and were otherwise qualified for teaching high school students.

It is not quite true that no teacher could teach this syllabus. A teacher with a good fundamental training in chemistry and botany could take this syllabus and successfully present the subject to high school students. But if we are looking at it from the standpoint of State system of public instruction for all practical purposes, it is true. It is probably true that the Agricultural College in this State will not in the next ten years graduate enough men and women to supply the needs for agricultural instruction should it be placed in only the township high schools of this State. This is on the assumption that such college graduates would be qualified to teach, and if qualified, would be willing to accept the positions offered. One phase of this question may be illustrated by calling attention to some statistics concerning agricultural college graduates.

The institution with which I have been connected for four years has in that four years given 122 degrees to students in agriculture. There have been given 85 first or baccalaureate degrees, 32 second or master's degrees, and 5 doctor's degrees. It will be recalled that these statistics include the class which graduated on June 20, and that the oldest graduate is of but three years' standing. The average compensation received by 30 of those having first degrees and whose salaries are known, has been, during the past year, or will be during the coming year in case of recent graduates, $1,039, and for 25 having advanced degrees, $1,612, or the average compensation for 55 whose salaries are known is $1,300. This is in most instances their initial salary. A short time ago I compiled the initial salary of 21 persons who had been students of mine and the average was $1,030.

Is there no way of getting agriculture taught in high schools? There is, I think, a perfectly feasible and simple way to reach this question. As is well known to the members of this audience, it is a common practice in summer schools for students to receive the same instruction and to get the same credit in German, Latin, French and other subjects in six weeks as they receive by pursuing the subject through the academic year in a University. In a University the students may pursue six three-hour subjects for 36 weeks, or he or she may pursue one of these subjects during six weeks in the summer school. Now if it is possible to prepare a teacher to teach German or French or Latin or physics in the high school by six weeks of continuous instruction in a summer school, it is possible to prepare a teacher to teach this syllabus on agronomy at a summer school especially organized for this purpose. A teacher cannot be taught all there is to be known about agriculture in six weeks any more than he can be taught all of physics or German, but he can be prepared to teach this syllabus.

Through the direction of your State Superintendent of Public Instruction, Dr. N. C. Schaeffer, this plan is to be given a trial in this State this summer. There are under the supervision of the State Superintendent of Public Instruction three summer schools located at Pocono, Mt. Gretna and Ebensburg. Arrangements have been made for professors from the School of Agriculture of The Pennsylvania State College to teach teachers to teach this syllabus on Agronomy. The Columbia County Summer School, under the direction of Superintendent Evans, also wished to have similar instruction given if a suitable teacher can be obtained.

This plan is fundamentally different from the one that proposes to make agricultural college graduates principals of high schools.

It is not the purpose to train agriculturists to become teachers, but to train teachers to teach different branches of agriculture. There are a number of things to be said in favor of this plan. In the first place, it will work. It is perfectly feasible to assemble any number of already well-trained teachers and give them the necessary subject matter or put them in the way of getting it in six weeks. To show them the method of teaching this syllabus by actually performing every demonstration lecture, every laboratory exercise and taking many field excursions which these teachers would repeat during the year in the high school. A set of laboratory apparatus and the materials necessary for the successful presentation of this subject could be prepared at this summer school and each teacher supplied with an outfit. This is an entirely different matter from teaching boys and girls who have studied agriculture or Latin or physics to teach one or more of these subjects successfully.

In the second place, this plan does not contemplate any change in our present agencies for education which in any State system of education must be considered. All the various universities, colleges and high schools will continue to educate the youth of the State. Normal schools and summer schools of the usual sort will continue to train teachers to teach. The sectarian colleges will lose none of their influence by this new education, since they will continue to educate the young men and young women as far as their facilities will allow.

In the third place, this plan of instruction is so simple that no new agencies are needed, and so far as I know, no new laws need be enacted. The only thing that is necessary is that there should be a real, sincere, demand by the people for this education.

There were in 1900 about 225,000 farmers in Pennsylvania. If we assume that the business life of each farmer does not exceed, on the average, over a third of a century (the average is really probably much less), then it follows that 7,000 persons begin farming each year, who never farmed independently before. Do the members of the State Board of Agriculture believe that the State possesses any responsibility for this body of men (who annually begin to create wealth from the soil) while they are between the age of 14 and the age of citizenship, the most important period in the development of every boy. Do you believe that the prosperity of this Commonwealth would be enhanced by teaching them during this formation period something of that large body of knowledge relating to their calling that is now available? If you do, you possess both a duty and a privilege. It is to create a demand in communities where now no demand exists and to make effective that demand where or when it does exist.

ENTOMOLOGIST'S REPORT, NO. 2.

By Prof. Franklin Menges, *York Pa.*

Mr. Chairman, I have only an informal report to make, one, I should say, that is mainly suggestive. In connection with a few others, I have tried to find something that would be of value to the members of the Board in their efforts to destroy the San José Scale. My own idea is that the farmer is entitled to something that will destroy it as cheaply as possible, and as thoroughly, at the same time.

We do know that there is a great deal of difficulty in the preparation of the lime and sulphur mixture. I am not going to talk against it; I use it myself; but I find that there are a great many people who have a great deal of trouble in its preparation, and they are sincere in their doubts as to its efficacy. For instance, one man told me that while he knew the color of the lime and sulphur wash, when properly made, should be a dark brick brown, when he prepared it, it came green. I asked him what lime he used, and he said he used Magnesium Lime. That explained it. It was just as efficacious in destroying the scale as though made of calcium lime, but the color gave the man some trouble.

A number of experiment stations have made formulas for soluble oils, and have issued bulletins for their preparation, but I doubt if they are any more simple in their preparation than the lime and sulphur mixture. Now, take this, for instance: Carbolic Acid, 2 quarts; Fish Oil, 2½ quarts; Caustic Soda, 1 pound. Heat to 300 degrees Fahrenheit, and after the mixture is taken away from the fire, add 3½ quarts of Crude Petroleum and 5 quarts of water. This substance we call the Emulsifier, the part of the mixture that will give it uniformity. The other part of that mixture is made thus: 1 part water, 8 parts Emulsifier, 16 parts Crude Petroleum, 4 parts Rosin Oil. Mix thoroughly together, and you have a twenty-quart soluble oil.

Now, I would like to know whether that is easier to make than the lime and sulphur wash? It is certainly more difficult. Therefore, the soluble oils do not help matters very much. You know very well that the average farmer would not go to all that trouble and expense. So, in order to see whether there might not be some other remedy for the San José Scale, besides these soluble oils so difficult to prepare, and the lime and sulphur mixture, not much less so, we tried the following: 3 pounds of light soap (any soap that would float in water; I would not recommend any particular soap), 10 gallons water; heat the substance in the air, and make a solution; then add 15 gallons coal oil.

After that mixture is thoroughly emulsified, you can make out of that twenty gallons, one hundred gallons of spray, and apply it. I am glad to say that with us it had the desired effect. It killed the San José Scale.

Then we did a little more work along this line. You know the lime and sulphur mixture is credited with having fungus effects also, and in order to determine whether this same principle could not be applied, we made a mixture something similar to the one we had already made; we took 15 gallons coal oil, and with it we mixed 8 ounces Carbolic Acid.

This we dissolved with one pound, or you can say, two or three pounds, as you like, but I prefer two pounds of the soap that we have already talked about, and sprayed it, and it had the desired effect.

STARTING IN THE PURE BLOOD LIVESTOCK BUSINESS.

BY S. E. BRADFUTE, *Xenia, Ohio.*

The average family in these United States is composed of 4.6 persons. This average family, we are informed by statistics gathered at Washington, consumes in one year: 431 pounds of beef, to which is added 49 pounds of veal, making 480 pounds of beef product; 39 pounds of mutton, 30 pounds of lamb, making 69 pounds of mutton products, and 465 pounds of pork, making a total number of pounds of meat consumed in a year by an average family of 1,014 pounds.

When we consider the immense amount of money that is invested in the livestock business in this great country of ours, I need make no apology for coming to you this afternoon to discuss for the second time some of the features connected with the livestock industry in this country of ours, and particularly for coming before you to discuss this afternoon a subject that lies very close to my heart, that of engaging in the pure blood livestock business. This subject was mostly prepared for the purpose of talking to younger men, who are about to engage in the livestock industry, and in the pure blood business, but I certainly am not averse to talking to the fathers of these young men, knowing that in many cases it will be very much through their fathers and brothers that these same young men will engage in this livestock business.

A young man often wonders, in settling on the farm, whether or not he can gain any special recognition by living on the farm. Young men often feel, and I have noticed that particularly in young men who go to colleges, and used to feel a great more than they do now, that when a young man goes back to the farm from his college studies, he is simply going back to hard work, and nothing else. Now, that is not true. I want to say this to the fathers of the young men who are here, that the young man can gain as much—shall I say notoriety? No; that is hardly the word; but a young man can gain as great a reputation on the farm, engaged in the livestock business, and will stand a better chance, I believe, to gain that reputation, than in almost any other business into which he may go. I know that the livestock business in Pennsylvania has hardly reached this importance yet, but I am not afraid to stand here and say that many of you gentlemen who are here can name more prominent livestock men in the State of Pennsylvania than you can name Congressmen. I believe that the average livestock man is better known throughout the length and breadth of his county than is the average Congressman. I know that every boy believes that he would like to be a Congressman, but I do not see why he would not just as soon go into the livestock business, and gain his reputation by means of the livestock business than he would by going into Congress, or in any other way. I have often wondered that the people of Pennsylvania have allowed the prominence they once had in that direction to go down. It is, gentlemen, one of the things that I cannot understand, why such a county as Washington, in Pennsylvania, that once stood in the very forefront of the livestock business of these United States, no longer holds this reputation, as it once did. I have often wondered what has become of the Berry's and the McNary's, and others who were once engaged in the livestock business in Washington County, Pennsylvania. You have allowed other counties to outstrip you in this particular. It is not because the same material is not there; the same material is there to-day that has always been there; and you have other counties that are better qualified than Washington for this business. Some of the Southeastern counties of your State are better qualified for this purpose than was Washington, but you have allowed other nearby states to outstrip you in this industry. Particularly is this true since the Varguns of old Virginia and West Virginia went into this livestock business.

Now, I would not advocate any young man going into the pure blood livestock business who has not a love for the business. He must be a lover of pure bred livestock, or I do not believe he will succeed very well; and not only that, he must select the kind of livestock that most closely appeals to his taste, in order to succeed. Now, if a young man has decided to go into the livestock business, I would recommend him to go into the pure bred livestock business. I believe that the Eastern people are particularly the people from whom emanated the pure blood livestock. You have heard of the importance of good seed corn, and it is the same in the livestock business. You get the best results from the best seed, and the pure blood livestock is furnishing the seed for the livestock business. We have told you the enormous amount of meat consumed in this country, and every time a man eats a piece of meat, he wonders why it is not better. The only way it can be made better is by the use of pure blood livestock. Yet the farmers are going on in the same old way, ignoring what it seems to me, is one of the best and most important means of success.

Now, if the young man is going to start in the pure blood business, what is the first thing for him to do? I should say the first thing he ought to do is to go to the city, and look around him, to find out what other people are doing, and what they want. I should want to send that boy to college, first of all. If I were in Pennsylvania, I should want to send him to the Pennsylvania State College, where he would learn something in that line, where they would teach him what the very best kind of animals are, and what are the very best of their kind. He would get an opportunity to see what are the best. Then I would encourage him to go away to the best fairs, at which he will see the very best kind of animals exhibited, and the best of their kind. There is no place as good for that purpose as a large State Fair. I don't know why you people here in Pennsylvania do not have a high-class State Fair. You have a few good county fairs, but my knowledge is that the very best livestock is not taken to these county fairs. It needs a high-class State Fair to induce the breeders of fine livestock to exhibit them. At a high-class State Fair you not only see the best your own State has to offer, but the best that the country has to offer, and often the best that foreign breeders have to offer. It prevents a man from settling down into his own locality, and getting into his head that his own particular kind of stock is the very best, better than any other can be. I don't know anything better to overcome this than to have that man take his stock to some place where it will come into competition with first-class stock from other localities; that man will go home with new ideas in his head, and start in making his system better.

So the first thing I would advocate in starting in the pure blood business is to see what is the standard, and what the conditions of pure bred stock. Then, when you have decided on the particular kind of livestock breeding in which you want to engage, whether cattle, sheep, or hogs, then find out the particular breed that appeals to your taste. I am not here to advocate any particular breed; let the young man find what will suit him, and then study his locality. He must have his market in view, how he will dispose of his animals to the best advantage. The market to which he must send these animals must largely determine the breed of livestock in which he wants to engage. The two must work together, the particular breed of the stock, and the character of the market.

After you have decided on what you are going to have, select a high ideal to work up to. I like to think of the livestock man as a sculptor; he takes the plain material, and out of it he works his ideal; he knows before he starts what he is trying to do. It is hardly possible for him to fully reach that ideal; he always sets it a little higher than he can reach, but the ideal is there all the time. An ideal that is easily reached is too low to be of much value. So, when a man is going into the livestock business, he must have his ideal, and he must purchase his animals with reference to that ideal, and I would say to the young man going into the livestock business, "don't expect too much of the animal at once." Don't undertake it largely until you know what you are doing. Don't undertake to invest thousands of dollars until you know you are right. Don't undertake to buy the fabulously high-priced animals until you know they are the right thing for you to have. There are men who can buy animals worth from a thousand to five thousand dollars or more, but it is not, in my opinion, good business for the beginner. He must be sure that he can make the business go, before it warrants such an expenditure.

Now, in my opinion, the first thing is to get good, high-class grades of good, pure blood sires. I believe any man should use purebred sires if he wants to produce the best results. It is only by fixing a high standard, and long breeding along certain lines that we can obtain the best results. It is when the animal becomes a steer, and has shown certain tendencies, towards which we have been breeding a long time, that we can depend on it. When you have the sires that approach your ideal that you can depend on them to produce that line, and when you have a sire that is not pure breed, you can not depend on him producing progeny that is more than three-fourths like him. The grade progeny may look like some of his ancestors than like him, therefore I would use a pure bred sire in my herd until I could find out what I could expect to accomplish, and then you can begin to invest in something a little more costly, but do not make the mistake of getting anything but the best. The men who have made the greatest success in the livestock business are not the men who have started in with their hundreds of thousands of dollars. They have gone into it slowly, with the expectation of building up success. You cannot expect to reach success in one year, or two, or expect it, indeed, without heavy work, or even in one generation, but often only in two or three generations. If I have made any success in livestock growing, I attribute it largely to the fact that my grandfather started in the business, and my father continued it. I am simply making use of some of the things they found out. I am glad to see that the agricultural colleges of to-day are giving their students the benefit of such study as the ordinary man could not get. We find in the class-room the instructor bringing together all the valuable information that has been gathered by successful breeders all over the country, and they can teach the young man so that he can start in where the older livestock man left off. It is a wonderful thing to think of, that the young man, starting to-day, has the experience of generations to guide him. You older men who are in the business had to find things out only by your own experience, by hard knocks. But the young man of to-day has not only your experience, to profit by, but the experience of hundreds of other breeders, which has been gathered together and put in books that he may have it.

Now, I said something about studying the markets. We must also study the locality; what is it; will it back you up; will it be friendly to you, or not? There are always two kinds of neighbors in each neighborhood, the friendly and the unfriendly kind. There is the neighborhood in which nearly everybody has some kind of livestock, which will, necessarily bring men from a distance. I know several years ago a man near us started in the same business as mine, and some of the neighbors said "that man is going to be a rival to you and take away some of your business." That man was wealthy, and could succeed in business, and I knew it, but I said " my friends, he will not harm me, he will help me." "Why," they said, "how can that be; he is in the same line; he has finer farm lands, and more of them, and he will take away your trade." I said "time will tell." Time did tell; what did it tell? When people from a distance began to think of livestock, they consulted the list of breeders, they said "now, here are two large breeders of horses close together. This is the place to go." And they came to us, hundreds of these buyers. Now, do you see the point? Now, it happens that there are not only two, or four, or six, or eight breeders right in that section; now, when a man who wants to buy comes to that section, he thinks "here I can have the benefit of competition and selection." So they came in large numbers, and instead of hurting us they help us. Why, some of you remember when Washington County was a great breeding county, how people went there, not because Benjamin McNary was there, not because there was a whole community of breeders there. If you could take the Southwestern section of the State you could find breeders from the Virginias there because they know they would find a variety of stock there.

Now, there is another locality that seems to me desirable, and that is the locality where almost all kinds of livestock are grown. I do not know whether it would be of any use to tell you of a little section in Southwestern Ohio where you can find a town with a certain five-mile radius, ten miles diameter, but in that little spot can be found more pure blood livestock, and more kinds than can be found in any like spot anywhere. Almost every breed of livestock that you can think of can be found in that community. A few years ago, of the various Boards of Officers of the National Recording Association of livestock such as Shorthorns and Angus, and sheep, there were one hundred and forty-six located right in this little spot. And when any International Exhibition opens at Chicago, there is at least one, and sometimes three, of the judges selected from this little territory. At St. Louis there were five herds and flocks went from this territory. They won the prizes, and 150 did twice, and 147 were premier or champions of the show, and yet they all came from this little territory. I have known as many as nineteen carloads shipped from this little point to the Ohio State Fair, and almost every exhibit of the first class.

Now, I think you can see the value of such a locality if you engage in the livestock business; each man engages in a friendly rivalry to have the best of the class he breeds and by having the different kinds to select from, they draw a high-class of buyers to that community. For instance, say here in Pennsylvania, and out West there are two men who want to buy Oxford rams and Shorthorn bulls, or some Chester White or Duroc hogs. Now, they will get on the train and go where they can buy all these things. Now, they have the advantage of each other's counsel and advice when they want to buy, so they go together to a community like the one I have just mentioned. Now, nearly every one of the men I have just spoken of are young men; very few of them have reached the age of fifty years, and yet if I were to name some of these men you would know them as men of national reputation—better known than the average Congressman of the United States, or even of Pennsylvania. So I want you to see what can be accomplished in the livestock business.

But, you say, we have not got this market; you never will have it unless somebody begins, but I do not know of anything that will make a man feel within himself that he is of some importance than having first-class livestock to offer. You know how proud a man feels when he wins a prize with his stock. When a man achieves success in other walks of life, there are many things that may contribute thereto, but when it comes to the livestock business, it is the work of the man himself that insures success. In the livestock business you have so many exceptions to contend with. There are so many variations. He has to be constantly with his stock, and studying it, and striving to bring it up to a high state of perfection. He is constantly thinking, and he has to be man of education because he is constantly thinking.

Now, there is another thing that seems to me to be of special importance to the man who starts in the pure blood business. He must not only be a man of education and culture so that he can talk and think intelligently, but he must keep his home and his surroundings in good condition. When men come four or five hundred miles to see him, he begins to think he is of some importance, and he cannot afford to have them come to a tumble-down place. He must fix up; he must make his home more pleasant, because he must entertain strangers over night. Then his neighbors begin to think that Smith is getting to be of some importance, and they begin to help him a little. If there is one thing that I am proud of in that little community that I have been telling you of, it is that there is no little petty rivalry or jealousy there. Everybody feels that they have got to help the other fellow, and if a man comes there with a hundred dollars, he won't get away until he has spent that money. If the cattle breeder can't sell him cattle, he may turn him over to the sheep man, and if he can't be interested in sheep, he will probably be induced to buy chickens before he gets home. For this reason I feel that the man who would engage in the pure blood livestock business should be a man of high culture, and business ability. He must not only work for his own interest, although that always comes first with us all, but he must help the community in which he lives. If he cannot sell a man, he should at least endeavor to keep the money in the community; you know what a stimulus it is to a community to feel that every man in it is trying to build it up in character and finance. You fathers know what it means to your sons to live in a community where every man is doing something for himself first, and for the community at large as well. That is the kind of man we want to grow in this country. We want to improve the livestock of the community and at the same time we want to improve the community. I know of nothing that improves a community more than high-class livestock, because it means a high-class man behind that livestock.

Now, I propose to say a few words in regard to that starting out in this business. One of the first things you want to know is how to attract buyers. I think I have indicated a little as I went along some of the ways in which you can attract buyers. The very first thing is, that you must have your stock in such condition that it will attract buyers. You must know that there is nothing more disappointing than to travel three, four, or five hundred miles to see a man's stock, and then find that stock is not what was promised you it would be. Instead of being attracted, the buyer is driven away. He has lost his trust in you because you have misled him in that way. There comes the importance of being a good judge of good livestock. You can describe your stock in every possible way as first-class stock, but when the buyer comes there he will soon see you have misled him, if it is not what you represented it to be. There is nothing like seeing, to convince a man, and these buyers are, nearly all of them, good judges. And after you have once misled a man he will never trust you again. It is far better to make the animal a little worse than it is, rather than better than it is. Therefore your first motive should be that your animal should be of the stamp you represent it to be. You will get many cases of mail orders, because the men have not time to come. This is a mistake, in my judgment. No man should buy blooded stock as he would buy a pig in a poke; he should see the stock, and become familiar with the type of the stock, and with its character. Many men make the mistake of thinking that simply because an animal is pure bred he is all right. It is a very common thing for me to get letters something like this: "Please quote me price on calves three or four months old, or on bulls three or four months old.

Quote them as cheap as you can make them, because I have written to several other breeders, and the one that makes me the best offer will sell me the calf." Now, I have learned that it will not be well to sell that man. He simply does not want to pay for a good animal; he wants the commonest, most ordinary, little calf you have, if you will let him have it cheap. His letter indicates that he does not care for breeding; that it does not matter how the animal was bred, or where. Now, that is not so at all. It is like buying a suit of clothes from a clothing house. If a man were to write a clothing house simply to send him a suit, without stating what kind he wants, or what size, or how much he is willing to pay for it, they would probably write him that they could supply him with a suit all the way from ten dollars up to fifty dollars or more, but they must have some more definite information. That way you would probably get your money's worth, and it is just the same in the livestock business. A man should know just what he wants, and how much he is able to pay for it. I frequently write to such a man and give him a range of prices, and then ask him to tell me what he wants, and how much he is willing to pay for it, and I am often able to lose a buyer of that kind in this way.

Then there is another thing that is of great importance to the man who wishes to attract buyers, and that is to take sample animals from his herd and exhibit them at the county or State fairs. There he can reach from twenty to fifty thousand people in one day—more than he would be able to interest in any other way in a year. It is one of the best advantages the livestock breeder can have. People will soon see whether his stock is worth anything or not. Here it is brought into competition with the same kind of stock from all over the country, and a man will soon see that he has by no means the best that can be bred along certain lines. If he has any sense, he will take advantage of what he learns, and set about further improving his stock. But at these fairs you will often find men who come prepared to buy the leaders, and here is the breeder's opportunity for establishing a reputation. Perhaps that man comes from a neighborhood into which you have never sold anything, and you are sending that sample into that neighborhood for criticism. If what the breeder has said about that animal is true, he will have gained an opening there, but if you have misrepresented anything about that animal, it will come back very quickly, and will frighten away other buyers, instead of attracting them. In the livestock business it pays to tell the truth, the whole truth, and nothing but the truth. The market you create for your animals depends upon what you promise for those animals. If the animal you sell into a new community comes up to its reputation, then your market is established; if you have misrepresented it, the animal will come back, but the buyer will not, nor any other buyer from that community. Of course, you cannot guarantee how many years an animal will live, or how many progeny it will have, or anything of that kind. But you can guarantee that it is perfectly healthy at the time you sell it, and you can guarantee his conformity to the type from which you have bred him, and you can guarantee his pedigree. These things you can guarantee, and must guarantee if you are going to succeed in the livestock business.

Now, I think I have perhaps taken all the time I should on this subject, but I am somewhat interested in it. I have wished and hoped that there would be more young men interested in this particular line of work, in the breeding of pure blood livestock, because, as I have said before, and repeated time and again, I believe that there is nothing that will so enable a man to build up a character and reputation as will engaging in the work of breeding pure blood livestock. I thank you.

MR. HUTCHISON: The gentleman spoke of the decline of livestock breeding in the western part of the State, particularly in Washington County, and wondered why it should be so. The explanation is quite simple. Since it has been found that there is coal in these lands, the coal companies have been buying them up at high prices, and developing the mines. I know, for instance, one farmer, who had been a breeder, who sold his land to a coal company at $7,000 an acre, and he and his family are living on their money. Others are just sitting on their land, and holding it waiting for the coal buyer to come along. Our friend Mr. Barnhart who used to come here has just sold his farm for $250,000. This is what has taken the trade out of the western part of our State. Out in Indiana and Washington counties you used to see the finest livestock you could see anywhere, but you see very little of it now. It is the money in Pennsylvania that has taken the agricultural prosperity away from that part of the State. There is nothing finer in the world than to walk out and see the growing of the young Jersey calf, or of other fine cattle. I would rather see something that I raise myself, and take care of myself, than to have a whole houseful of Congressmen. If I were wealthy, I would buy a herd of fine cattle and bring it into our township, and try to raise the general standard there, but I am not wealthy, so I can't do it. I hope it will come when you will see up at State College the finest herd of Guernseys that can be found, and a man can go there and find what he wants to improve his stock; or go to Brother Young here for Brown Swiss. The trouble is, that we have always been so anxious to make money that we have forgotten to improve our agriculture. My people all went to Ohio and prospered. I was the only one that stayed here. I am naturally proud to see Ohio take such a high rank in the breeding of live stock, but I am not sorry I stayed in Pennsylvania, because I think we are going to make an effort, at least, to regain our old prestige as livestock breeders.

REPORT OF PENNSYLVANIA STATE POMOLOGIST.

BY DR. J. H. FUNK, *Boyertown, Pa.*

I have the honor to present the following report on the fruit conditions of Pennsylvania for the year 1907. Throughout the United States the year 1907 will be recorded as an unprofitable year, not only in one but in all the fruits, being the smallest in yield in many years.

Apple.

The total yield of apples in the United States for the year 1907 was 23,990,000 barrels, divided as follows:

	Barrels.		Barrels.
Pennsylvania,	3,000,000	New Jersey,	400,000
New York,	2,800,000	Connecticut,	400,000
Maine,	1,700,000	Illinois,	350,000
Kentucky,	1,500,000	Maryland,	300,000
Tennessee,	1,300,000	Colorado,	250,000
Michigan,	1,200,000	Idaho,	200,000
California,	1,000,000	Arkansas,	200,000
Ohio,	800,000	Wisconsin,	200,000
New Hampshire,	800,000	Iowa,	150,000
Vermont,	750,000	Utah,	150,000
Virginia,	700,000	Delaware,	150,000
West Virginia,	650,000	Missouri,	100,000
Massachusetts,	600,000	Rhode Island,	100,000
Indiana,	600,000	Montana,	50,000
Oregon,	550,000	Nebraska,	40,000
Washington,	475,000	Kansas,	25,000
		All other states,	2,500,000
	18,375,000		5,615,000

Or a total of 23,990,000 barrels for the year 1907.
38,280,000 barrels for the year 1906.
24,310,000 barrels for the year 1905.
45,360,000 barrels for the year 1904.
42,626,000 barrels for the year 1903.

A total of 174,566,000 barrels for the five years.

Pennsylvania has produced in these five years, 21,800,000 barrels or one-eighth of all the apples produced in the United States during these years. During the year 1903 she produced one-fifth.

It is only of recent years Pennsylvania has been recognized as an apple producing state, but in this time she has gained the position of second and it will not be long before she will stand at the head. More than three-fourths of 1907 large apple crop was produced east of the Allegheny Mountains, and a very large proportion east of the Susquehanna River. Why is this? Ask those living in the non-producing sections and they will place Providence in fault, severity of weather, late frosts, &c., yet we find the climatic conditions about the same, we must look for other reasons.

The true reasons are, during the past ten years, since the advent of the San José Scale, those people having orchards in the eastern part of the State, noting the rapid decay of their orchards through this pest became aware that if they did not give better attention to their orchards they would soon be dependent upon other states for their fruit. Consequently they pruned out the dead and otherwise useless wood, cultivated and fed the soil, and gave their trees thorough spraying, these combined gave them a new lease of life, they responded to this liberal treatment and are repaying their owners ten fold for their time and expenditures. They have also planted new orchards and these are receiving modern methods of culture, which will in the very near future render the horticultural branch of agriculture one of the best paying industries in the State.

During the winter I spent several weeks travelling through the western counties of the State, and have given particular attention to the fruit conditions. I find the past season the apple crop, with few exceptions was nearly a total failure. I have been through all the large and small towns and found very few apples for sale, and those a poor second, while oranges are offered in great quantities in all stores where fruits are sold. Is it not a lamentable condition in a section of the country so especially blessed by nature, to neglect one of the most healthful fruits God has given us, and which can be raised almost without an effort. And import the poor half ripe oranges as a substitute. I find even worse conditions with the farmers. I have visited many farm homes the past winter and the apple or any other kind of fruit seemed to be a luxury beyond the reach of its members. Is it any wonder that children pray for deliverance from such surroundings, and there is no provision being made for the future.

In twelve of the western counties, I did not see twelve young orchards that had been planted within the last ten years, and the old orchards are woefully neglected, literal brush heaps, so thick with limbs and water sprouts that the vitality of the tree is exhausted in supporting the life of the tree that there is none left to bring fruit worthy of the name. These same people assert that fruitraising does not pay, and yet they have a veritable bonanza within their possession and do not recognize the fact. They are in the best portion of the great apple belt of the United States, they have an altitude of from 1,000 to 1,500 feet above sea level. The soil is well adapted as shown by the trees that have grown under neglect and starvation. The same conditions exist with other fruits, I never saw more thrifty cherry trees than I saw in Butler and adjoining counties. These same people tell me it is useless to plant peach as they will not last, and yet at W. Sunbury, Butler county, I saw large trees growing in sod, without pruning or other attention that the owners tell me have borne successive crops for 15 years. The same experience is had in Crawford county, between Franklin and Blackash. In this section I saw as thrifty apple, pear and peach trees, with bark clean and smooth as I saw in any portion of the State grown under the same condition. Here would be a good location to have an orchard of select varieties of fruits under competent management to demonstrate to the people the possibilities of fruit raising in Western Pa., where there are thousands of acres of sutable land that is now laying idle which could be converted into a great source of revenue.

Pear.

The pear crop this season (with a few local exceptions), was considerable below the average in quantity and quality owing to negligent methods of culture, where orchards and isolated trees have been receiving proper attention for a number of years, the crop was all that could be desired. At the Paragon Fruit Farm the crop was abundant, but a part was under size where the trees were in sod and had not been fertilized for a few years and the fruit not sufficiently thinned. These are essentials that must be observed to obtain success, care must be observed to avoid too much Nitrogenous food.

The pear is being sadly neglected, few trees are being planted, for fear of the blight, which has destroyed many trees the past few years, and yet it is an easy fruit to raise and very profitable. Blight has not been serious in S. E. Pa. the last few years, except where kept under high cultivation, which causes too succulent a growth, rendering them very susceptible to the disease. The Bartlett pear should be more extensively planted as it is a pear of high quality, valuable for canning or for eating out of hand. The market demands this fruit at high prices, the past season choice Bartletts brought from $6.00 to $7.00 per barrel. The Seckel is another variety that should be more extensively planted. The season of the year at which it ripens, its beauty, high qualities and productiveness all recommend it.

Peach.

This choice fruit gave a very light crop the past season, not only in Pa. but throughout the United States, owing it is claimed to climatic conditions being unfavorable. It is so much more pleasant to put the blame on nature, than to acknowledge ourselves in fault. But where orchards were suitably located, hardy varieties planted, pruned, fertilized, thinned and cultivated as they should have been, the crop was good, and above the average in size and flavor. Prices realized were very satisfactory.

No new varieties of any special merit have been introduced the past season, the number of trees set were rather under, than over the average.

Plum.

The plum crop was very light, unfortunately this valuable fruit is being neglected, a few years back when the Japan varieties were introduced, large areas were planted, as they were recommended as curculio proof. Although they did not prove so, they were for a few years very profitable, but from over-production, or lack of vitality they soon ceased to be profitable. They are very susceptible to the Peach Yellows and other diseases, and as they have died off the other finer varieties have not been planted as extensively as in former years, and it is now very rare to see any large quantities of choice plums on the markets. The curculio is the worst enemy to the growth of the finer varieties of plums.

Cherries.

This fruit was almost a failure, very few trees of any variety had a crop. The sour cherry does very well throughout the entire State. The finer sweet varieties are very difficult to raise, they fruit well enough, but the difficulty is in maintaining the tree, they are so difficult to get started that the majority of the farmers become discouraged. The bark splits open on the sun side. Young trees should have their trunks protected the first few years. The western farmers are even neglecting the sour varieties, giving them up to the black knot. If they would prune these off and burn, and spray their trees with the lime and sulphur solution while the trees are dormant they could raise abundance of this choice fruit.

Small Fruits.

These were also below the average in quantity and quality. Taken as a whole, the past season was rather an unfavorable one, few farmers realizing any profits from their orchards. But the few who have given their orchards special attention have found the past season one of the most remunerative in many years. This again forceably impresses upon us the importance of giving the best attention, and never was the value of thorough spraying more plainly seen. This should be an incentive for better care in the future.

NITRIC ACID MANUFACTURED FROM ATMOSPHERIC NITROGEN.

By Prof. J. August Fries, *State College, Pa.*

The dream of converting the atmospheric nitrogen into nitric acid and eventually into saltpeter cheaply enough to be used on the farm as a fertilizer, has at last come true, and factories are now turning out large quantities of saltpeter. It shall be the aim of this paper to explain in part at least the methods employed for this purpose, but before going into detail of the latest and most promising process of manufacture of nitric acid (HNO^3) from atmosphericnitrogen, I shall briefly review, or make mention of some of the well established facts concerning the importance of the nitrogenous compounds, and some of the causes which have led up to the establishment of the industry referred to.

Importance of Nitrogen Compounds:—In our institutions of learning as well as in literature, great effort is made to prove to the students the importance of the nitrogenous compounds, and justly so. They are met with everywhere, and are daily handled by all of us in food, and clothing such as contain hair, wool, silk, or leather. Indeed the nitrogenous compounds hold the foremost place of all compounds met with in the plant and animal economy. Every living cell in all plants, for instance, contains more or less, but always some, nitrogen in the form of protieds and other compounds, together forming a mass going by the name "protoplasm" and without which there can be no cell activity or life. The tissues of animals however, are almost entirely composed of nitrogenous compounds, and in order for an animal to develop and grow, the food eaten must contain nitrogen in combined form, that is, in so called organic combination. Hence in the nutrition of man as well as of farm animals these nitrogenous substances form one of the three main classes of nutrients, and which are: Protieds (by many called albuminoids), Carbohydrates and Fats, laying special emphasis on, or attaching much importance to, the proteids. The proteids, which are the nitrogenous substances, are represented in a general way by the white of egg and meat.

We are also more or less familiar with the nitric acid and nitrates, and the importance of these substances in connection with agriculture and various industries. They are used in a multitude of industries in many ways and combinations, for widely different purposes, from the making of the destructive gunpowder and other explosives wherewith to tear to pieces the very mountains to the delicate art of photography, everywhere nitrogen compounds are used. But it is especially in the art of agriculture where enormous quantities of nitrates are used every year, and because of the necessity of using such vast masses yearly, the question, of how to obtain enough nitrogen for the soil in the future, has become such a vital problem.

Quantity of Nitrogen in Crops:—A few reliable figures may be quoted and lessons learned therefrom. In the country of France, for instance, the cultivated area has been calculated to be about 61,750,000 acres, and the crops grown on this area use yearly 600,000 tons of the element nitrogen, but that with the very best of economy not more that 330,000 tons of nitrogen will be returned to the soil in the various manures. We will not be very far wrong if we accept these figures as representative of any country, and if we apply them to our land where we are supposed to have at least five times as many acres under cultivation, five times the quantity mentioned, or 3,000,000 tons nitrogen would be used yearly by the crops of our soil. But since we are on the whole much more careless and wasteful with our manure nitrogen than most European countries, we can not count on half of the nitrogen being returned to the soil in the form of manure but considerably less.

Nitrogen Needed in the Soil:—According to Lierke's calculations (Praktisohe Düngertafeln, Berlin 1887), one acre of soil should contain, or have so much applied to it, that there should be available for the various kinds of crops the following amounts of nitrogen:

	Small crop. Lbs.	Medium crop. Lbs.	Large crop. Lbs.
Cereals (grain crops),	29	51	92
Potatoes,	52	86	120
Fodder beets,	48	115	187
Turnips,	48	109	174
Carrots,	60	119	166
Meadow hay,	28	83	165

With our present methods of farming and knowledge of agricultural science in general, we must, for some time at least, in order to obtain the highest possible results, figure on that at least half of the needed nitrogen will have to be applied in the form of bought fertilizers to most of our oldest or longest cultivated soils.

Sources of Nitrogen Available for Fertilizers:—The chief substances used are Chili saltpeter (nitrate of soda), sulphate of ammonia, bone and guano. Of these, sulphate of ammonia is a by-product in the lighting gas and coke manufacture. The guano beds are the accumulated droppings of birds, and are found on the coast and islands in certain localities in the southern oceans, but the supply of this fertilizer is now practically exhausted. Chili saltpeter is found in beds in the mountainous coast of Peru and Chili, South America. Here the crude salt is mined, purified and prepared for the market.

Enormous quantities of this Chili saltpeter has been exported during the last thirty years, as can be learned from the following figures, quoted from a publication issued 1906 by the Norwegian Nitrate Manufacturing Co. The ton referred to- 1,000 kiligrams or about 2,205 pounds.

	Tons.		Tons.
In 1860 the export was	68,500	In 1890 the export was	1,025,000
In 1870 the export was	182,000	In 1900 the export was	1,453,000
In 1880 the export was	225,000	In 1903 the export was	1,606,000

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The estimated worth of the last mentioned quantity was about seventy five million dollars.

DISTRIBUTION OF THE CHILI SALTPETER EXPORTED IN THE YEAR 1905.

	Tons.		Tons.
To Germany (direct),	399,786	To Sweden,	22,896
To Great Britain (partly reshipped to Germany),	386,584	To South Africa,	21,574
To France,	222,824	To Sandwich Islands,	15,226
To U. S. A., East coast,	247,847	To China and Japan,	15,372
To U. S. A., West coast,	34,500	To Danemark,	12,090
To Holland,	97,842	To Austria,	7,590
To Belgium,	69,598	To Spain,	6,070
To Italy ,	38,916	To Switzerland,	2,346
		To Norway,	707

According to the computations of Prof. Dr. Otto N. Witt, Berlin, 1-5 of the Chili saltpeter is used for industrial purposes, and 4-5 of it in agriculture.

There is no nitrate rock formation, nor are there any natural stores of nitrogen compounds from which to draw, except these nitrate beds in South America, unless we include the newly found deposits of nitrates in California. These deposits are in the south east section, in San Bernardo county, extending across the line into Inyo county, and the beds mark the old shore-lines and beaches which indicate the boundary of Death Valley as it was during the Eocene times. Deposits are found containing from seven to sixty-one per cent. nitrate, and may be extensively enough to be of national interest.

Since the nitrate beds are in a sense only washed out manure heaps from sea birds, or animal remains, they are of necessity localized and of definite and limited size. New beds of nitrate are not being formed anywhere so as to be of any real value to the next coming generations, and it is therefore easy enough to see the inevitable result—the supply of nitrates must sooner or later became exhausted—and what then?

At the present rate of export of the Sodium Nitrate (Chili saltpeter F. W. Vergara (Chem. Ind. 1904 p. 29) has calculated that the nitrate beds will be exhausted by year 1923, only 16 more years, and should we even double the time it must surely take place during the present generation.

In view of this fact, that the largest source of fertilizer nitrogen supply is giving out, we can readily understand why the nitrogen question has become such a vital one for the scientific men everywhere, indeed, it has been so for a number of years.

The agriculturists and agricultural chemists have been asking: How shall the farmer get nitrogen enough for his crops in the future? Knowing that the air we breathe contains 79 per cent. nitrogen gas, it was very natural to look to this enormous, inexhaustible, supply and seek for means and methods whereby it could be made available to plants. Trials were made with plants to find out whether they themselves could make use of this nitrogen. Boussingault in the early fifties, 1851-1855, conducted experiments which indicated that plants could not assimilate the free nitrogen of the atmosphere, and the same conclusion was reached by Lawes, Gilbert and Pugh, through their elaborate experiments 1857-1858. But the investigations did not stop with these experiments, they were continued with different species of plants under varied conditions, and as a result, in the middle of the eighties, Hellriegel and

Wilfarth could call attention to the fact that the legumes possessed the power to make use of atmospheric nitrogen and therefore to store up nitrogen in their tissues. This fact has since been investigated thoroughly by many scientists, and it is now known to be brought about by living organisms—bacteria—which are the cause of the root nodules of the legumes in which they live, grow and multiply, building up atmospheric nitrogen in themselves into organic compounds. These compounds later on are used by the legume plant which acts as the host for the tiny bacteria. This is the socalled Legume Nodule Theory. Besides the bacteria living together with legumes, the power of other bacteria in the soil to gather nitrogen is also a problem under investigation.

This nitrogen gathering phenomenon, which is observed in certain kinds of plants only, although it does not in any way cover the demand for nitrogen on the farm has been, and is, especially since it is fairly thoroughly understood, a great blessing to the agriculturist and agriculture. While this knowledge has helped the farmer and in thousands of instances been the direct cause of prosperity on the farm, it did not directly help the technical man any. Other scientists, however, besides those directly interested in agriculture have been at work on the nitrogen problem, and of late years several attempts have been made to manufacture nitric acid and other nitrogen compounds from the atmospheric nitrogen on a large scale by means of electricity, but the efforts were not crowned with real practical success until within these last three or four years.

That atmospheric nitrogen could be oxidized to nitric acid was mentioned by Henry Cavendish, as long ago as 1786, who had made the observation that nitrogen mixed with sufficient oxygen would be oxidized during large electrical discharges causing high rise in temperature. In 1781 he had also observed that, in burning hydrogen, nitric acid also was formed. Priestly also made similar observations, about that time, in regard to the formation of nitric acid by strong electrical discharges, but it was left for our present time to apply that knowledge and make it of real practical value. In 1892 Crookes made experiments in the line indicated by Cavendish, but it was especially after the experiments of Lord Raleigh in 1897 were completed, in which the quantity of nitric acid obtained bore a favorable relation to the amount of energy used, that the question was again taken up with renewed vigor in different countries. Thus, in 1900, Dougal and Howles made the attempt to manufacture nitric acid. In 1902 Kowalsky and Moszicki operated in Switzerland using an alternating current of 50,000 volts. At the same time Muthmann and Hofer were making trials in Germany. In United States a company was organized under the name of "The Atmospheric Products Company" with a capital of one million dollars, and which built a factory for the purpose of utilizing the power of the Niagara. This company, also known as the Lovejoy and Bradley company, used 10,000 volts direct current aros, and by this process could produce 70 per cent. nitric acid. The efficiency of the apparatus, that is, the output of the nitric acid per killowatt year power was good, and the acid was produced at a cost of a little less than 1.6 cent per pound for power or energy, using a current generated by Niagara water power at twenty dollars per year kilowatt. But the machinery was too costly to keep up to make it a paying investment, and in 1904 it failed and the attempt was abandoned. Pirot and Gay in France made attempts to bind the atmospheric nitrogen on a large scale in 1903 but failed in reaching practical results.

In Germany about the same time, 1903, the firm of Siemens and Halske in Berlin began operations, adopting Frank's method which consists in allowing pure nitrogen to act on alkali earth carbides. Calcium carbide, for instance, when heated moderately absorbs nitrogen forming a compound known as Calcium Cyanamid, also called "Lime Nitrogen" in commerce. This salt decomposes quickly in the soil to ammonia, etc., and has proven to be a good fertilizer, in some cases equal to Chili saltpeter, but whether by this method it shall be possible to produce the nitrogen compounds at low enough cost to be considered a practical success remains to be seen, or whether the cyanide salt can be used under all conditions, or whether it is harmless to plants at various stages of development.

Frank and Caro began experiments 1895 for preparation of carbides with a view to the manufacture of cyanides. First Barium, later Calcium, was used as the base, but instead of cyanide being produced, the product was the barium of calcium cyanamid (written $BaCN_2$ and $CaCN_2$) which yielded cyanides on fusion with alkali salts. Heated with water under high pressure calcium carbonate and ammonia were formed according to the following chemical equation: $CaCN_3+3H_2O=CaCO+2\ NH_3$. The better grade amids contained 14 to 32 per cent. nitrogen. By dissolving the cyanamide in water and crystalizing in the cold a dicyanamide $(CN^2H^2)^2$ with 66 per cent. nitrogen is formed. This Frank's method has been operated cheapest in Italy where cheap water power is available.

The latest and undoubtedly the most promising, and practically successful method in operation for oxidizing the atmospheric nitrogen, is the Birkeland and Eyde method now in operation at Notodden, Norway. The oxidation of the nitrogen is done in an arc produced by an alternating electric current of a very high voltage—5,000 volts—and a frequency of 50 periods per second. It is the peculiar structure or shape of the arc flame which gives it a great power for oxidizing nitrogen, and which phenomenon was observed by Birkeland and Eyde. It is the efficiency due to this peculiar shaped flame which makes it possible to utilize such arcs for the oxidation of the free nitrogen at low enough cost to make it pay commercially. The arc is namely made to flatten out into a thin disc-like flame by passing it through the field of a powerful direct current magnet, and it is the use of this arc flame for chemically uniting nitrogen and oxygen that has been patented and is now successfully used at the place mentioned. The electrodes are thin walled copper tubes about 1.5 c.m. diameter, and through which flows a current of water. The points of these electrodes come within 6 to 8 m.m. of each other, and the ends of the magnet come perpendicular to the electrodes, and a few inches apart. It is because of the action of the magnets, as well as the water flowing through the electrodes, that the latter are not melted in the high heat formed, but can carry the current for several days and nights before they need to be renewed. The magnet prevents short circuiting at the electrodes.

The reason why an arc of this disk-like shape is better and more efficient than the arcs used by Lovejoy and Bradley, and others, is, that it presents more heating surface with the same power than any other. For it is a question of how much gas can actually come in contact with the flame in a given time and be heated to the required temperature. The oven in which this arc-flame is generated has the shape of a cheese standing on edge, and is of considerable size, since the flame, formed by the electric current already mentioned, is six feet in diameter. On the other hand the flame is extremely thin (only a couple centimeters thick) so that while the inner chamber is a little over six feet one way, it is only a couple inches the other way. Around the flame is firebrick containing air channels and perforations through which the air current is forced into the flame, and is again collected into an outlet located close to the inlet opening. The air as it leaves the oven is highly colored on account of the nitrogen tetroxide (NO_2) fumes which are formed when the air leaves the oven. This thin arc flame has a temperature of about 3,000°C., but the gases as they leave the oven have a temperature of about 700°C. Air passes through the oven at the rate of 25,000 liters a minute, that is, in the three ovens at Notodden 75,000 liters (about 75,000 quarts) air are treated each minute.

At 3,200 degrees, absolute temperature, according to "Nernst," the formation of 5 per cent. nitric oxide (NO), by volume, should be possible. These ovens were tested with the following results: During several consecutive days and nights the gases leaving the oven were found to have a temperature of 700° C., and the nitric acid (HNO_3) obtained per liter gas, reduced to O° and 760 m.m. pressure, was 30 milligrams. This corresponds to 1.06 per cent. nitric oxide by volume in the gas, which is equivalent to 4.58 per cent. nitric oxide (NO) by volume in the gas while it is exposed to the arc flame.

At the high temperature of the arc flame only nitric oxide is formed, the temperature is too high for nitrogen tetroxide (NO_2), and the nitrogen trioxide (N_2O_3) to exist. The nitric oxide which is formed and is present in the air as it leaves the oven must be oxidized to higher oxides. This oxidation takes place of its own accord in the presence of air ($NO+O=NO_2$), and the nitrogen tetroxide in the presence of water is changed into nitric and nitric acids, as shown by the following equation: $2\ NO_2+H_2O=HNO_3+HNO_2$. At the existing high temperature the nitrous acid is decomposed into nitric tetroxide, nitric oxide and water thus: $2HNO_2=NO_2+NO+H^2O$, and these residual gases must again be changed into nitric acid. A residue of gases is therefore always present.

Method of Changing the Nitric Oxide (NO) into the Marketable Products.—When the gas mixture leaves the oven it has a temperature of between 600 and 700° C. The hot gases, in order to utilize the heat they carry, are conducted through a steam boiler generating steam to be used later in the process. Here the gases are cooled down to about 200° C., and are next led through a cooling apparatus where they are reduced in temperature to about 50° C. From this cooling apparatus the gases enter a large iron tower or cylinder, called "oxidation cylinder," which is coated on the inside with a paint preparation which resists the acid. This cylinder holds about 12 cubic meters (about 15 cubic yards) and therefore gives the air a little time to oxidize; it being changed about 6 times a minute. Next the gas mixture passes in the absorption system which is composed of stone towers 2X2X10 meters inside diameter. There are two absorption systems in parallel at the factory. Each row or system is composed of two granite and two sandstone towers filled with quarts which is being drenched, or kept moist, by slowly trickling water, which takes up most of the nitric acid present in the air current. A fifth tower in each system or series is filled with ordinary bricks, which are kept moist with milk of lime. This lime takes up the rest of the nitric and nitrous acid gases, and forms calcium nitrate and calcium nitrite.

By a special arrangement of containers at the top and bottom of the towers, the acid liquid from tower number 4 is pumped to number 3, from 3 to 2, and so on, so that the strongest acid is in tower number 1. From there it is removed, having a strength of about 50 per cent. acid, and conducted to a row of open granite vats, where it is stored until needed for further treatment. A portion of this acid is used for breaking up the nitrite which accompanies the nitrate of lime in the fifth tower. By addition of nitric acid to the lime mass, containing both nitrate and nitrite of lime, in a closed vessel, the nitrites are broken up and the acid radicle set free and driven back to absorbers again. The reaction which takes place is as follows:

$$Ca\ (NO_2)_2+2\ HNO_3=Ca\ (NO_3)_2+H_2O+NO_2+NO.$$

The lime solution containing the pure calcium nitrate, plus nitric acid, is placed in other vats, mixed with the other acid and neturalized by adding limestone. This neutralized mass is then evaporated in iron vessels, down to a boiling point of 145° C., which is equivalent to a 75 to 80 per cent. concentration of calcium nitrate, or about 13.5 per cent. nitrogen in the mass. When this point of concentration is reached, it is poured into iron cylinders of about 200 liters (about 50 gallons) capacity and cooled. The solution solidifies into a pourous, easily pulverized mass which is ground up, packed in paper lined wooded boxes, and is then ready for the market. If the neutralized solution is concentrated to a boiling point of 120° C. it will crystallize, and the crystals, freed from the mother liquid by centrifugal force, are the pure calcium nitrate ($Ca(NO_3)_2=4H_2O$), the new nitrogen fertilizer.

This salt can be made into a basic salt, with excess of lime, having 8 to 9 per cent. nitrogen. This basic salt is not so hygroscopic but remains dry in the air, and is therefore undoubtedly more convenient for fertilizing purposes than the crystallized nitrate. But the other peculiar form of nitrate, containing about 13.5 per cent. nitrogen as already mentioned, is also less hygroscopic than the crystallized salt, can be handled and sown by machinery, and it is in this form that the new fertilizer appears in the market. By using sodium hydrate in the last absorption tower, instead of lime hydrate, a mixture of sodium nitrate and sodium nitrite is obtained, and 80 to 90 per cent. of the salt formed may be nitrite which will crystallize out almost pure. Thus a very valuable substance, $NaNO_2$, may be obtained as a by product. This sodium nitrite is used in making azocoloring stuff. The sodium nitrate can also be obtained from nitrate by melting it together with lead, according to the following reaction, $NaNO_3+Pb=NaNO_2+PbO$. The nitrogen can also be recovered from the sodium hydrate solution by treating it electrolytically. According to Cassel, the nitrates and nitrites both form ammonia which is driven over by boiling, and is caught in nitric acid thus forming ammonium nitrate.

Cost of Production and Capacity of the Establishment.—The Factory at Notodden, not far from Skien, Norway, was opened May 2, 1905, and has three electrical ovens each using 600 to 700 kilowatt current as being the most economical, although they can work with 1,000 killowatts each. The electric power is obtained from the power station at the waterfall Tinfos, where there is for industrial purposes a three phase generator of about 2,000 kilowatt capacity, and with a voltage of 5,000 between the phases. According to Dr. O. N. Witt, the cost per horse power per year at Notodden is about $3.00, or $4.02 per kilowatt, and that the possible production is 500 to 600 kilograms (1,100 to 1,320 lbs.) water free nitric acid per kilowatt year. The average daily output, however, is reckoned to be 1,500 kilograms (3,300 lbs.) water free nitric acid.

Comparing the cost of production at Notodden with that of the Lovejoy and Bradley Co., at Niagara we have: At Notodden one kilogram year power—$4.02. When 2,000 kilowatts are used the daily production of nitric acid is 3,300 lbs. (1,500 kgs.), or in other words, 600 lbs. water free acid are produced per kilowatt year at a cost of 4.02 dollars. One pound water free acid, according to that, costs 0.67 cent for power of production, and one pound 70 per cent. acid about half that amount. It is estimated that, at Niagara, it costs the Lovejoy and Bradley Co. 1.6 cent for power for one pound 70 per cent. nitric acid produced, when the kilowatt per year was 20.00 dollars. Besides having cheaper power at Notodden, than at Niagara, the machinery and apparatus are less costly in the Birkeland and Eyde method than in the Lovejoy and Bradley one, hence the success of the former process.

This new fertilizer which is called Calcium nitrate, also Lime nitrate, is not to be confounded with the substance called "Lime nitrogen" which is calcium cyanamid. The fertilizing quality of the calcium nitrate has been tested in different countries as Norway, Sweden, Denmark, Germany and France, by both pot and field experiments. The results of the experiments show that this nitrogen fertilizer is all that could possibly be expected of it. Its fertilizing value, pound for pound of nitrogen, was found to be equal to that of Chili saltpeter. In a number of cases where the soil was poor in lime it even surpassed the Chili saltpeter, and this is only reasonable to expect on account of the lime it added to the soil. A few experiments showed less increase in yield for the lime nitrate than for Chili saltpeter. It was tried with oats, barley, hay, beets, mustard, potatoes and other crops on a great variety of soils. If any particular kind of plants did show a greater liking for this material than the others, it was the mustard which in nearly every case gave much greater yield with calcium nitrate than with Chili saltpeter.

It can now be said: The nitrogen problem has been successfully solved, it remains only to develop large enough and numerous factories to supply the needed quantity.

REPORT OF THE MEMORIAL COMMITTEE.

RESOLUTIONS RESPECTING PROF. GEO. C. BUTZ.

WHEREAS: Prof. George C. Butz, whose untimely death occurred at State College on December 14, 1907, reminds us of the uncertainty of life, and to be also ready, while we bow in humble submission to Him whose ways are past finding out:

RESOLVED: That in the death of Prof. George C. Butz the Board of Agriculture has lost a valuable specialist, as Apiarist, whose reports were of great value to us and the State at large. We admired him for his faithfulness to duty to the Board, his friendly manner and cheerful disposition.

The State has lost a valuable Institute lecturer, whose work was greatly appreciated throughout the State, because of his knowledge of horticulture and floriculture, and his work in fruit growing. The College has lost a valuable Professor, whose work in teaching, bulletins and investigations, were valuable to the student body, as well as to the State at large, and we shall not soon see his like again.

RESOLVED: That a copy of these Resolutions be sent to his family, and that they be spread upon the minutes of this meeting of the Board.

RESOLUTIONS RESPECTING WILLIAM H. BROSIUS.

WHEREAS: God, in His wise providence, has seen fit to call to higher work our brother and fellow members in the State Board of Agriculture, Hon. William H. Brosius, member from Lancaster County.

RESOLVED, THEREFORE: that we bow in humble submission to Him who doeth all things well, and deeply sympathize with the family and friends of the deceased, and thereby express our sorrow in the loss we have sustained, and extend our sympathy to those bereft of a dear one.

RESOLVED: That a copy of these Resolutions be sent to the family of the deceased, and also be spread upon upon the minutes of the Board.

RESOLUTIONS REPECTING R. H. THOMAS.

WHEREAS, Death has removed from us a veteran member of this Board (by appointment of the Governor), Col. Robert H. Thomas, of Mechanicsburg, Pa.,

THEREFORE BE IT RESOLVED: that in the death of Col. Thomas this Board has lost a member who when in health and strength, was a vigorous and fearless defender of the rights of the farmer, and an educator of great experience and force, and one whose influence was ever exerted to extend our power and efficiency.

RESOLVED: That our smypathy be extended to his bereaved family and friends.

RESOLVED: That a copy of these Resolutions be sent to the bereaved family and be spread upon the minutes of the Board.

RESOLUTIONS RESPECTING FREDERICK JAEKEL.

Having learned of the death of Frederick Jaekel, member of this Board from Blair County, who died January 19, 1908, we desire to express our appreciation of the valuable services Mr. Jaekel has rendered to this Board, and to the Agriculture of the State.

Mr. Jaekel was kind and affable in disposition and manner, and was therefore a favorite among those associated with him. In his death this board has lost an efficient member, and his community and the Commonwealth have lost a good citizen.

We extend to the immediate friends and family of the deceased our heartfelt sympathy and direct that this tribute be spread upon the Journal of Proceedings, and that a copy be sent to the family of the deceased.

(Signed) J. A. HERR,
MATTHEW RODGERS,
J. NEWTON GLOVER,
Committee.

HORSE BREEDING IN PENNSYLVANIA.

By Dr. Carl W. Gay, *Philadelphia.*

The substance of what I have to say regarding this subject of horse breeding in Pennsylvania is simply this: Is it to our advantage to breed more and better horses in Pennsylvania? Now, my position in relation to this subject is somewhat unique. I hold a position created by the Pennsylvania Legislature, which is intended to encourage horse breeding in this state.

The first question that presents itself is, is it worth while to encourage horse breeding. Now, you must remember this: The work has already three instruments behind it to urge it on; the first is, the Breeders' Association; the second, the bill passed by the Legislature, and signed by the Governor, and the third, the creation of the position I hold, and my acceptance of it shows you what I believe in regard to the matter.

Now, what I have to say to you tonight is not to instruct you what to do, but I am here more in the search of information than anything else. With these three agencies of which I have spoken to help the work along, is it worth while to encourage horse breeding in Pennsylvania? It would be very improper for me, a stranger in the State, and so much your junior in years, to come here and tell you what to do, but I hope by what I have to say to excite a little discussion, and get your views. The stallion law that has been passed will not be able to accomplish anything without your cooperation, and I am here to try to enlist it.

In the first place, we know that there is only one state that has more horses than Pennsylvania, and that is New York, but when we take the United States' Hand Book, taking horses by counties, you find that Pennsylvania stands twelfth. Why is this? Because the larger proportion of our horses is in the cities. The proportion on the farms is so much smaller. There are eleven states that have more horses on the farm, and only one that has more in the cities. Now, horses in the country may be taken as the source of supply; horses in the cities may be taken as the basis of consumption. See the vast difference between consumption and supply here! See the great opening for the horse breeder here! We hear a great deal about home protective tariffs, and we see it carried out in other lines; but I don't know of any line to which it could be more profitably applied than to keeping in the state the money that is annually spent on horses, and letting other states take care of their own products.

The United States Department of Agriculture has compiled the average prices of the Omaha market from 1901 to 1906, taking the three standard horses, the coach horse, the draft horse, and the road horse—the draft horse leading in numbers; he has held closely to the average price of $150 as a minimum, and $295 as a maximum; the coach horse, less in numbers, minimum, $300, maximum, $750; road horses, $150 minimum, $375 maximum. This, it seems to me, simply shows that the horse market has been stable; that the prices it has shown within the last six years have been constant. Now, I could give you statistics that would show an average increase. In this state the average price is $109; this is an increase, because it is the average paid for farm horses. For instance, in Texas, which was formerly second, but is now third (Iowa is second, and Omaha first) the price has dropped. And here is the reason: there is no hay or grass for good pasture. A few years ago New York was one of the greatest hay producing states in the Union, and I think it is so yet. You put the average hay crop, and the average price of hay in two columns, and I think you will find them good wealth. The average New York farms would not pay for the buildings on them. Pennsylvania land, so far as the pasture is concerned, rises in value in proportion to the pasture. So eminent an authority as Sir Walter Bilbee of England, says that the limestone soil is of the greatest importance to the breeder. You take the Irish horses, especially the Irish hack horse; we all know what he is, and he is the product of the limestone. He is light and agile, and finely finished. The coarsest horses are produced on corn soil. Illinois leads in the production of corn, and it has the highest priced corn of any state, but its pasture produces the coarsest horses. When you talk about feeding and fattening horses for the market, then corn is a valuable factor in that discussion. So with the sheep land. I think that in the matter of pasture we can classify reasonably. Mr. Bradfute spoke this afternoon of the ideal, and I think it is well always to have that in view, and since I have been in the State I have tried to get an expression on that point.

I find in doing the county fairs that there is very often a mistake made in the classification. In some fairs there has been no attempt at classification, and in some there was in use the classification adopted by the State Breeders' Association, but the entries were not properly classified. It is a frequent thing to see horses that should have been classified under one head, in the other class; of course in the class they were they would not get a ribbon, whereas if they had been in their proper class they would have been representatives of their kind.

Now, in this regard another thing. In one of the counties a man showed horses, and he was very much displeased that they did not win a ribbon; he said he had been breeding this kind of horses for thirty years, and didn't want any one to tell him about horses. Now, the facts were these: he had a certain breed of horses, which had certain characteristics, which the breeders had been trying to eliminate for the past thirty years, and had nearly succeeded in eliminating.. Now, the point was this: he had kept out of touch with the market for thirty years, and had lost sight of the standards, and he had the same horses today that he had thirty years ago, without a single improvement. Instead of keeping in touch with the market, and thoroughly conforming to it, he kept on breeding in his own way, and today his horses are not up to the standard that the market wants. If you have any market close to you, you will not sell any horses, no matter how good, unless you keep in touch with that market, and find out just what its standards are.

The markets of today recognize five grades—four classes and a misfit. The first is the draught horse, weighing from 1,600 to 2,000 pounds, the type is adapted for movement of the greatest possible loads, and not expected to move those loads very fast. Second, the coach horses, adapted for carriage work in the cities; third, general driver, and fourth, saddle horses. Now, the question arises, it seems to me, "which is the most profitable type for us to devote our energies to?" With most farmers the ordinary draught horse is the one preferred. Draught horses can be bred very well to do the ordinary farm work. You must raise the horses on the farm, and you should have the mares, and then you have the results to produce this class. But here comes in the question of variation in breeding, one of the most trying things a breeder has to contend with. We know the old maxim "like begets like," and the breeder often reasons on this basis only to be disappointed. He has reason to look for more than a good average, and he gets less than a good average. Now, if you will take a hundred draught colts, and compare them with any other kind, and you will find that they are more nearly what the breeder wants than any other kind of horses will be. They are generally put to breeding earlier, or if not that, they are put to work as two year old fillies. We don't do both. If we don't care to breed these colts, we make half horses of them; that is, we make them do half a day's work. It won't hurt them to work a little. Then, if you have left any stumpy ground, or anything else that may cause injuries, this class is much less apt to become injured than any other class, and even if they are injured, the injury is less than the other class or classes. Then there is always a market for this class of horses. There is no great demand in movement, but there is always a market for the good, steady draught horse. These, it seems to me, are five very good reasons for the breeding of draught horses. No man on the Allegheny mountains should try to breed draught horses. They can better be grown where everything is succulent, and a second crop of pasture for them.

There is no horse in the market for which there is such a steady demand as for the coach horse. In times of depression like this, there is no demand for draught horses. When business is not there, the draught horse is not wanted. In coach horses the chief difficulty seems to be to find a pair that will be harmonious in every particular. Only people who have tried this can tell, and this, I think, explains the difference between what is first paid for the horse, and the price at which he is finally sold. I have been trying for three months to get a coach pair, and I have gone the length and breadth of the State to look at many pairs, without finding what I was looking for. Most of these people thought they had exactly what would fill the requirements, but it only shows the great lack of information on the part of the farmer. Now, if a man has the proper fences, and does not work his mares too hard, and knows the standard of a good coach horse, this is the kind for which there is a steady demand at good prices.

Now, the next type I am afraid to discuss, for fear of being misunderstood. A horseman said to me last night that the trotter is the curse of every county that he has ever been taken into. I want to ask you how many men you know who have succeeded in making money as breeders of trotters? It is a rich man's business. When a man says they are farmer's horses, he doesn't know what he is talking about. They require too much finish, and too much hot blood to be of any use on the farm. The average man can use anything from a wagon horse, to a high class coach horse, but he does not want to handle stable horses. Up at State College a few weeks ago, the question was asked why, if the farmers in the West could make money on the stable horse, the farmers in the East could not do the same thing? Now, it seems to me that the answer is this. In the West weight is the standard. The precedent was established in 1851 in Ohio, and it was weight ever since. Two years previous (in 1849) in New York State was bred the first Hamiltonian sire, and he set the standard for speed in the East, so that today in the West weight is the standard; they breed horses that will weigh 3,200 pounds, and a few that will weigh 4,000 pounds; in the East, speed is the standard; this speed was set at 2.10, or something like that, and we have been trying to maintain or improve on that ever since. Draught horses are the product of the West, where weight is the standard; the speed horse is the craze with us, and that is the reason every farmer thinks he must go to breeding trotters. A man recently made the statement to me that New York is a veterinary hospital for sprains, ringbone, spavin and kindred diseases. They are not due to one generation, but it is the result of breeding these fine horses from one generation to another. They take the finely finished, hot-blodded speedy horse, and hitch him to the grocery wagon, and drive him with a heavy load over the mountainous roads of New York, and this ring-boned, spavined animal is the result.

Now that we have some idea of the correct type or types, How shall we get them? The first thing is the introduction of pure blood, and a gradual grading up to the ideal. If you doubt the efficiency of this, go into the Pan-handle district of Texas; ten or twelve years ago it would have been difficult to find anything different from what the packing houses designated as "cutters" and "canners." But since then Col. Slaughter and others have taken to Texas bulls that cost over $5,000 a piece. He first graded the cows on the ranches to this $5,000 bull, and then the calves are brought back to another $5,000 bull making them three-quarters pure bred. Now, it seems to me that this same rule will apply to Pennsylvania today, grading up and grading up to a higher standard from one generation to another. Now, in order to accomplish this, the first thing to do is for the men who own the mares to pay more when he goes to horses. The man who owns the horse will tell you, and with reason, that he can not afford to pay two thousand dollars for his horse, and then bring him here for a fee of ten dollars, and yet, that is all the average man is willing to pay. Now, it seems to me that that man should be willing to pay more for a better horse. He is getting the benefit of it in the grade of half pure blood that will raise the standard of his horses. I would like to hear this question of the grade thoroughly discussed. You have a law now in force in this state in reference to licensing the stallion. I don't know whether that law is as thoroughly understood as it should be. I get a great many letters in reference to it. For instance, I have a letter from a man in one of the Northeastern counties of the State, in which he says, "I have a horse that cost me $2,500; I ask $25 for service; my neighbor has a horse that he did not give anything for, and he asks $4.00 fee. Yet people are more willing to pay the $4.00 fee than to patronize my horse." Now, we are telling this man and that man what a grade horse is, and why we use him, that it is the key to the situation; that by means of it we propose to raise the standard of our horses. If I were to select a sire for my horse, I believe one of the first things I would look to is listed fees, and the first one I would investigate is the one with the highest fee within my means. I do not mean to say that a man is justified in paying a hundred dollar fee, but anything at ten dollars or over. Why, take the ten dollar fee: you are getting results that you can multiply by ten times ten dollars, and you are getting pretty near reaping a profit on that horse when he becomes a grade. And I believe that you can take every dollar you pay less than ten, and multiply it by ten, and it will represent the loss to you on that horse.

Now, in regard to this grade, why should we discriminate against him? I will eliminate one class of grade horses. In fact, there is only one kind of grade horse that I would consider: that is the horse that has stood in the community and has demonstrated his ability as a breeder. If he has demonstrated his capacity to get good grade sons, then I would not say anything against him, but there is no guarantee goes with him. Here comes in this principle of variation again. The horse that is only partially of superior blood may reproduce his inferior strain and characteristics in his progeny just as easily as he will the qualities that come to him from the other side. Now, the difference between grade and pure bred is simply this: the pure bred is a reproduction of the same good qualities from one generation to another, and you know what he is going to do; with the grade you have you have no assurance as to what he is going to do. Now, Mr. Bradfute about a year ago gave a definition of pedigree that I have never forgotten. It was simply this: that pedigree is a composite picture of ancestry. Now, as composite picture is one made of many. Now, if you have a pedigree, it is not only of the names, but of the type and characteristics of the ancestors, and where the ancestry is of a clear type, it is the picture of an individual. In the other breed you have a picture in which the individual predominates; it shows a little of the one side, and a little of the other. It is not a clear picture. Now, if you take these pictures at the same time, and under the same conditions, the pure breed will show the type and characteristics of the ancestry from which he has been bred while the other will not show up clearly. A clean pedigree will make a clean picture. The purebred has been re-inforced along that one particular type sixty-four times, and he becomes the expression of the type to which he has been bred. He simply leads the same physical life that has come down to him directly through the preceding generations, and when I see a pure bred horse, I am sure of uniformity.

The next thing to consider in a horse is soundness. Hock is one of the commonest forms of weakness in a horse. Very many horses are all right in every way, only weak in one leg, and the only way to eliminate this unsoundness is to take that horse out of the list of the breeders. I should qualify this, though, by saying hereditary unsoundness. Some of you may have known cases of unsoundness that, as the horsemen say, don't belong to the horse. A horse may receive a bruise or an injury, the results of which are noticeable in him, but which he will not transmit to his progeny; it is when that unsoundness becomes hereditary that we must eliminate it if we want to improve the breed of our horses. There is a great deal of misunderstanding in regard to the law as it relates to this very matter. I will take it up point by point, for I am assuming you are interested, and want this information. The law requires that every horse, whose services are offered to the public, must be enrolled with the State Livestock Sanitary Board. It does not mean in the Prothonotary's office. That comes later. The first thing to do is to have him enrolled with the State Livestock Sanitary Board, which then issues a license to the owner of the animal. These licenses are made out in three forms: they designate the horse as pure bred; as grade, or miscellaneous bred. When a man wants a license he must submit the pedigree of the horse, or the certificate from the association the horse is in. Now, a great many men don't like to surrender these pedigrees or certificates, because they cost them from three to five dollars, and they are not sure that they will get them back. You will get them back in as good order as you sent them. The thing for you to do is to send them by registered letter. This will show you that we received them, and we will guarantee to send them back in the same condition we received them. Now, if you can't show this pedigree, then your horse is called a grade. There is great disappointment among many owners that the grade is included at all; I receive a great many letters making complaint of this, but, gentlemen, don't you see that we cannot cover everything at once in the law? This act was simply a start, and we hope to improve it from time to time, making such amendments as are shown to be proper, until we have the law as we want it. Out in Wisconsin—this law is based on their law—there have been numerous amendments in the two years it has been in force. Things cannot be done in too radical a manner. Don't criticize the law for its imperfections yet; it has only gotten a start, and will be taken care of later.

Now, regarding the matter of the elimination of the unsound horse: when a horse is to be offered for public service, and the owner wants a license from the State Livestock Sanitary Board, his application must, as I said, be accompanied by the pedigree or certificate from the Association in which the horse is, and also by the certificate of a veterinary surgeon, or if that is not possible, by the owner's affidavit that the horse is free from all unsoundness. You may say we are running great risks in accepting the owners' affidavit, but you will notice that the form of the affidavit uses the words, "after diligent inquiry," and in the large majority of these cases the owner is honest in what he swears to; if he is not, we are very apt to learn it in some way very soon, and he makes himself liable to prosecution. Then, too, there are not many of these horses.

There is another type of superior horses, to which a certificate of approval is issued. This is in the manner of France, where they pay a subsidy for certain types of horses, and in cases where a horse is of superior type, and yet does not come under the subsidy act, he is given a certificate of approval. It is a high recommendation to breeders of the excellence of these horses. There will not be many of these certificates. It does eliminate the unsound horse, but it does not eliminate the grade horse who has demonstrated his superiority. It designates just what the horse is, and it is taken for granted that the man who presented him for license is honest; that he presented him in the right light, and will do what is right. Now, this is the law as it is in force at the present time.

Now, to come back to our subject, "Is it worth while to encourage horse breeding in Pennsylvania," I would simply say this: the figures seem to warrant it. I will not repeat them, but will only say that I spent a little time with the horsemen in Philadelphia last night, in order to get prices to use here to-night. There are many men, I was told, who would rather buy a horse in Pennsylvania than anywhere else, but they have not got the horses. "Why not?" I said. He said "they have not the stock, nor the blood. You may wonder why I buy my horses in Kentucky; I will tell you; they can guarantee their horses there; they know what they are breeding; here in Pennsylvania we have no guarantee." The conclusion, then would be simply this: it would be worth our while to encourage horse breeding in this state, impressing on the breeders first of all to breed in conformity to the market demands for these horses, and then breed a certain class of horses. If you will read the market quotations on horses, you will find that the lowest priced horse is the unclassified horse. So it seems to me that the first thing to do is to get our horses properly classified, and then introduce pure blood, until we get our standard up to the market demands; then there will be no trouble to find the market.

ABSTRACT OF PROCEEDINGS OF THE THIRD ANNUAL CONVENTION OF THE FRUIT GROWERS ASSOCIATION OF ADAMS COUNTY, HELD DECEMBER 18, 1907.

COMMERCIAL APPLE GROWING FROM THE STANDPOINT OF A NEW YORK GROWER.

By Mr. T. B. Wilson.

Mr. Chairman, Ladies and Gentlemen.—I can say with Mr. Scoon that I thank you for the invitation extended to us to be with you. We, I think, are about as you are, we are looking for information and it is certain that there is no one man that is capable of giving it all to anybody. I believe, Mr. Chairman, that the fruit growing business is in its infancy. What I have to say to you here, I am afraid don't bear all together on your conditions. It seems to me that your conditions are different from ours in many ways. What I have to say is from the standpoint of a Western New York fruit grower, and where it differs from your methods and your experience, I hope you will jot it down, or if you prefer to ask questions any time during my address, it will not throw we out, and any questions I am able to answer when I get through I will try to do it. Mr. Scoon said that he is sorry to see that there are so few young people here. I think he learned that especially from being at our New York meetings. I wish we could induce the young people to attend the sessions more than they do. Mr. Scoon has two boys and is going to induce one of them to stick to the farm, but the other is not. All the boys can't stay on the farm. If they did the cities would go to the bad. There are probably a great many things in this world that a young man can engage in to make more money than fruit growing, but he cannot obtain more social pleasure, and real life, from any other business. There are reasons enough for anyone to follow it. I don't know of anything better than fruit growing to develope knowledge, and love of nature. We all have been very careless about observing common things. We do not observe things as a botanist or a plant student would, and do not see one-half the things they would see. We should study, observe and profit thereby.

Now, in talking of things from the standpoint of the Western New York grower, I will begin at the beginning and go to the end in a short, minute way and try to cover a few of the points. We all have our different views, but we begin first, by locating our soil. The soil conditions make such a difference in the kind of apples we are going to grow. In some localities they can raise Northern Spies profitably in another locality they can raise some other variety to better advantage. These things we have to decide for ourselves. We cannot trust the professors from the university to tell us, unless they have investigated that particular soil. These are conditions which come up against the practical man, and are for him to decide. The Baldwin is the commercial apple of to-day in our State. We select as good a lot as we have on the farm, preferably a clover sod, and prepare it thoroughly. We should prepare it as thoroughly as for a crop of potatoes or corn, and select and plant the tree in the fall. We plant our trees about forty feet apart. It is not too wide and the way I have been planting in recent years is to plant the row next the fence first, set this row twenty feet from the fence and the trees forty feet apart in the row. When planting the next row, set trees just half way between the trees in the first row, planting each row alternately. The rows are thirty-seven feet apart, thus bringing the trees forty-two feet apart on the angle. while in the rows they are forty feet apart.

I put a row of stakes close to the fence, all around the field the right distance apart for each row. Then, if you can see across the field, sight across the field from one stake on one side to the opposite stake on the other side, and have a man place a stake in the middle of the field, and in that way put a row of stakes through the middle of the field, each way. Then from either quarter of the field, you have two stakes to go by, in both directions, and do not have a stake to move, in either digging the holes or for setting the tree.

Be careful after you have planted six or eight trees not to look back to see is they are straight in the row, for you will find them varying a little from one side to the other. The last tree set may be one inch out of the way. If you go back and move it straight with the row and set another tree with the stake, you will find this one out of line with the row also. If you will leave them as they set and go according to the stakes, and stakes only, the row will be about straight when finished. Even if one tree is one or two inches out of the way, it don't make much difference, but if you pay attention of your stakes and not the trees, your trees will line in every angle in the orchard. Now in planting, we set the trees only about as deep as they were in the nursery rows. I prefer to plant them in the fall, even in our climate if we can. If we do not get them planted in the fall, we plant them in the spring as early as we can work the ground nicely.

In selecting trees, a great many men make the mistake of buying from agents who buy second grade trees from nurseries. They try to save all they can in buying and if they get a pretty decent tree they will buy a number of trees for six cents rather than pay twelve for a number one. Six cents is a very small amount for a fruit tree that we expect to be worth a hundred dollars in future years. When I am selecting trees to plant, I go through a nursery and select the trees that I want, and if the nurseryman don't charge more than double, I will be glad to pay it. I select good, thrifty growing trees—all Spy if I can get them.

If possible have them planted the same day they are dug, or as soon after as is possible, and cut all broken roots smooth before planting. In the fall of the year following I top work all of my trees by setting buds of the kinds I want. I top work them for this reason: you can go into almost any orchard in Western New York and find a fireat difference in the apples of the same variety. You may find six or eight different types. Take the Greening, you will find a flat Greening, you will find a round Greening, you will find a red checked Greening, etc. You can select just the kind you have a fancy for from the trees in your own orchard that you know to be a good variety. We have a Rhode Island Greening that when mature is large in size and a good winter apple, solid and firm with a red blush, and those are the Greenings which I prefer. I should have stated when recommending budding, that it might possibly be safer to wait two or three years and then graft. It is very hard to get the bud started in our country. We have the bud moth, which destroy the buds. You will find where you slit the bark for the bud, it makes a place where the egg can be laid, and the first bud the moth comes to when it hatches in the spring, is almost certain to be the one that you don't want him to get.

I select trees from the nurseries that have a central stem and set three buds in each tree. I find that the best plan is to have the trees all gone over two or three times early in the spring, when the buds start, and the moth pinched off and I have learned that if you take a pin while you are going over the tree and push under the bark where it was slit for the insertion of the bud, you will fetch them out, or destroy the egg. After the buds are started about three inches, you cut off the top of the limp just above the best bud and remove the other buds.

Set all three buds in the centre limb of the tree, on the last year's wood, so the bud that is left to make the tree will be straight and as nearly straight above the main stem of the tree as possible After the bud has made its year's growth you can go and head the tree back just where you see fit and the limbs that the top is made from, have grown solid. I have known orchards that were not top worked to spread right open, and so it is with the bud, it doesn't set quite so firm as the natural growth from the natural bud. You get all the top from that one stem.

Now in budding the orchard I have adopted the plan of not budding more than one consecutive row of the same kind of apple. If I want three or four kinds of apples I would bud them in alternate rows. Prof. Waite made a study of this years ago, and he was convinced that it made a difference in apples and pears as to the cross fertilization in the row. You get it in that way and you have an entire row of the same kind of apples across the field which is no disadvantage in picking time. We follow up the cultivation of the orchard for ten or twelve years, and we prefer to have some cultivated crop like corn, beans, potatoes or cabbage, and in each of these crops we fertilize very heavily and get as much growth in the first ten or twelve years as possible. We do not get much of a crop of apples until they are ten or twelve years old. and from Northern Spy not before they are sixteen or eighteen years old. By top working, I should have said, that we get apples a little earlier. We have had two and one-half bushels at eight years of age, on top worked trees. After a tree gets to bearing and bears as it should do, it does not make a very heavy growth. If we induce the growth of the trees too much after they come into bearing we will get a large growth of wood and it will not mature fruit buds. Therefore it makes wood and not fruit. We want the fruit We have to be a little careful about that. Now with me after the orchard gets into bearing, I seed it down and leave it seeded. I have said that I don't cultivate an orchard after it once gets into bearing. Ours is situated on a ridge that is underlayed with slate rock and the slate rock is within two feet of the surface in some places, and is full of water. We cannot get in the rock over three feet when digging for water. Dr. Jordan told me that if I ever made the statement in public that I did not cultivate, we would shake me up for it. He said I do cultivate. Well now, I don't plough my orchard, but I have hogs in my orchard, and they root. and that is the only cultivation that my orchards get, although they get barnyard manure every other year, and it is going to be a question with me whether I will have to cultivate to maintain those orchards, for I do not have enough manure. I am satisfied that I cannot cultivate all the time for it induces so much growth of wood that we cannot mature fruit buds.

Picking.

When it comes to the picking, we have had all kind of schemes devised, but we still have to pick them by hand, and of all arrangements I have yet seen for picking apples, there is nothing like a common grain bag with a walnut or a stone tied in the corners with a strap fastened to go over the shoulders, or a phosphate sack instead of a strap is easier on the shoulders. We pick all of our apples by this method. Now in my talk a little later on I have made arrangements to speak to you about co-operative work, but I will tell you what we can do at present. The dealers have changed their mode of buying and the bulk of the apples are now sold on a basis of tree run. We put them right into barrels without facing, and take them immediately to the storehouse. Many of the apples this year were bought in that way, otherwise we picked them into barrels and took them into the barns and set them there with the head out. On a rainy day we sort them. We have been in the habit of putting into the No. 1 barrel all apples which measure two and one-fourth inches or more, with a fair color and some green fruit if good size. All other sound fruit down to two inches are packed as No. 2's. Those below two inches go to the cider mill All the apples were packed and if they were not sold as soon as they were packed they were put into the storehouse. One of our storehouses holds about 1,000 barrels, another storehouse at the station will store about 7,000 barrels. Those storehouses are kept under my control until the apples are disposed of, and I will not sell my apples unless I rent the storehouse. Buyers often buy the fruit so they can control the storage. If we don't get a sufficient price for the apples, we will put them into the storehouse and sort them ourselves

Four or five men will work the entire winter in sorting them, and we sort them well. Make a strictly first class grade of apples, regardless of what it cost you. We have exported a great many of our apples to the old country. We were among the first exporters in Western New York, and had a very profitable business for several years, but there is a great deal of competition. But there is still a good trade for thoroughly sorted apples and it pays to sort well. The Tompkins County King is a first rate apple, but it never produces as many barrels to the tree as the Baldwin; but they are very saleable, and bring a good price. One year it happened that there was a shortage in Tompkins County King apples, and the English market was good. My father posted a notice that he would pay twenty or forty cents a barrel more than other dealers were paying, and he got all there were of that variety within a radius of four or five miles, in all 875 barrels. We bought them for No. 1 apples. They were all put into the storehouse and resorted. Every apple repacked was perfect and over two and one-half inches in size. We took out of those 875 barrels, 275 barrels of No. 2 fruit, put the 600 barrels of No. 1's on the cars and shipped them to Liverpool. The Liverpool quotations were $4.00 a barrel for Tompkins County Kings. We had to compete with the Canadian apples, which have always outsold the New York State apples, and yet because of fancy pack, we were paid $6.00 per barrel for the 600 barrels, or $2.00 above the market. We packed the balance and shipped to Baltimore unbranded. There was some rot to come out of the No. 2, but we came out even on the 275 barrels and made a nice profit on the No. 1. This shows what thorough sorting will do.

Mr. Eldon. How do you spray them?

That depends somewhat on the season. I spray three times, once just before the blossoms come out, and once just after the blossoms go off, and then just about two weeks later, and we sometimes have to make a spray between the two last sprays. After the blossoms fall all the apples are on the tree, upside down. There are four little leaves at the blow end of the apple, that are opened right out when the blossoms fall, and we try to get our poison in at this time, and it is foolish to spray after these leaves close. The last spray is more practically for the leaf blight and the fungus on the apple. The time differs in neighboring orchards. Sometimes there will be a few days between the fall of the blossoms in one orchard and that of another right across the fence. Don't go to the almanac, but watch when the leaves are open, but after the leaves close up you can wait two weeks, possibly, if it is dry, three weeks after the bloom goes off will answer for third spray. In spraying, we have been using five pounds of blue vitriol and one one-fourth pound of Paris green to fifty gallons of water. We use now a power sprayer. I am not advertising any particular sprayer. I am using the Deyo Sprayer, made in Binghampton, New York, but there are other sprayers just as good. It is run by a two and one-half horse power gasoline engine mounted on a wide-wheeled wagon. The gasoline engine is on the back part of the wagon. We have a two hundred gallon tank, and our proportions are made in accordance with the 200 gallons. Of late we have been using less copper sulphate. There have been conditions where I used 5 pounds of sulphate to fifty gallons of water, and injured the foliage. If there came a shower of rain and we went out to spray before the water was dried off the leaves, some damage would result. It seems to have some chemical action in such a way that when we spray just after a rain the damage is done to the foliage at that time. There in danger in using copper sulphate too strong. Three pounds to fifty gallons of water is about the right proportion. We use Paris green in the spray used before the blossoms open to kill bud moth. We have a home-made tower on the wagon from which spraying is done. Some companies are now making these towers of steel ten to twelve feet high. Now, in all our spraying, from one year to the other, and we have been at it for a good many years, I think we work down to finer nozzles each year, so that they throw the spray into a fine mist, so that you can see a rainbow at any time when the sun shines. We cannot spray against the wind with such a fine spray, so that if the wind is in the west we spray the west side and let the spray drive over the rows of trees, and spray the other side of the trees when the wind changes. By using a fine nozzle, it will take less spray material. We don't care to put enough of this material on a tree so that it will run off. Just as soon as you have enough on a tree so that it will run off, there won't half as much copper sulphate dry on the leaf. We use a "Mistry" nozzle, made by the Gould Manufacturing Company. We find that 200 gallons goes farther and does more good by using fine nozzles than when we tried to spray with coarser nozzles and less power.

Question. Do you find that apples bruise when picked into barrels and hauled into barn for subsequent sorting?

MR. WILSON: Yes, but there is less loss, than when placed on piles in orchard. Piling always dulls the color and they must go over the sorting table anyhow.

E. P. GARRETTSON: What age trees do you plant?

MR. WILSON: Two years old.

Question. How high do you head them?

MR. WILSON: About shoulder high. I think it would be a serious mistake to head trees too low if it were not for the San Jose Scale.

DR. MAYER: How would it do to wrap raffia about the buds to exclude bud moth?

MR. WILSON: We do use raffia, but it must be cut off about three weeks after budding, to prevent binding buds and preventing growth.

DR. MAYER: We place a broad band of raffia above the bud and find it keeps moth from depositing eggs in the crevice made in slipping buds.

PRESIDENT ELDON: What stock do you selcet for planting?

MR. WILSON: We prefer Northern Spies. They have good roots are good growers and make good unions. Stark is our second choice.

PRESIDENT ELDON: Is your stock root-grafted or budded?

MR. WILSON: They are usually grafted.

C. J. TYSON: Do you not think it would be an advantage in picking to have rows in pairs rather than single rows of a variety?

MR. WILSON: Yes, when picking directly to sorting table. When picking into barrels as we do it, it is best to have a row of two between of a different kind, as men do not talk so much, and there is more competition to see which row will be finished first.

J. W. PRICKETT: Do you select varieties for this inter-planting with a view to their time of bloom, so as to provide for cross fertilization.

MR. WILSON: No, not especially but I plant Baldwin Greening and Hubbardston Nonesuch which work good together.

Question. Is there any advantage in planting trees deep so as to withstand the wind?

MR. WILSON: We are not troubled at all with trees tipping out by the wind.

PRESIDENT ELDON: What kind of tools do you use for cultivation?

MR. WILSON: Common cultivators, gang plow, cutaway harrow and Baker harness.

MR. WERTZ: Does not the Baker harness hurt the horses?

MR. WILSON: No, not when properly adjusted. One of our men prefers to use it for ordinary plowing. I always insist that if one of my men bark a tree they must attend to it before they eat a meal; cover it with wax or something, to keep the air out.

Question. When do you remove the hogs from the orchard? Are they in there when you are picking the apples?

MR. WILSON: We take them out just as soon as the fruit is matured enough to make good evaporating stock.

Question. How many hogs do you keep in your orchards?

MR. WILSON: Not too many. Not over three or four to each acre.

Question. Do the hogs work all over the orchard?

MR. WILSON: They work over the orchard about as we do with the manure. A tree that has apples on this year will not touch. They work under one which bore fruit last season.

Question. Do you use any commercial fertilizer on your orchard?

MR. WILSON: No, we could never see any beneficial results.

C. S. GRIEST: How close together do you plant your trees?

MR. WILSON: Forty feet. I have one orchard that was planted in 1869, thirty-three feet apart, and three years ago we cut out half of those trees.

Question. How old do you expect your trees to get?

MR. WILSON: About 100 years.

Question. Do you ever head them back?

MR. WILSON: Most of these old trees are dead at the heart and it would likely be impossible to head them successfully.

Question. Where do you aim to start the first limbs?

MR. WILSON: About shoulder high. The limbs will come down to the ground when loaded. In my sixten or eighteen year orchard we have picked as many apples by standing on the ground as there were left on the tree.

W. H. BLACK: Have you tried alcoholic vapor as a preservative of fruit?

MR. WILSON: No, I think it has not proved of any value.

F. H. PETERS: Do you use any artificial heat?

MR. WILSON: No, we have no need for heat. A large bulk of apples together developes plenty of heat. Our sole concern is to keep temperature down and we do that by a system of ventilation.

J. W. PRICKETT: What is the cost of building storage?

MR. WILSON: Our house, 40x60, two stories, cost $2,200.00.

Question. How is your storage constructed?

MR. WILSON: It is built of concrete, two stories of twelve feet each. The walls of lower story are two feet thick. Those of upper story are twenty inches, thus forming an internal jog of four inches to receive ends of joist, which bear second floor. These joist are further supported by two lines of girders, each carried by four heavy posts, thus dividing the basement into five sections of twelve feet each. The basement is under ground for about half its height and each section is ventilated by external concrete flues which extend from floor level, where they penetrate to inside of walls, to surface of ground outside. The basement is further provided for ingress of air by means of five lines of fifteen-inch sewer pipes, which are laid in the earth forming basement floor. These run longitudinally from one end of building and curve upward to level of floor at their inner ends, terminating, one in the center of each quarter of the floor and one in the exact center of the basement The second story walls are lined on four-inch studding which stand on the jog mentioned above, and this four-inch space back of lining all around the room furnishes egress for air from basement to loft of building and thence to outer air through vents in roof, covers being provided for these vents so as to control ventilation. The barrels are piled up seven high, and the building holds 7,000 barrels. We used 5 parts sand and gravel, and 1 part cement in making concrete for this building, and also used a lot of field stones. These stones were placed in form, being careful that they did not lie within an inch of form, and then covered with a slush of the concrete mixture. Enough two-inch plank were provided to make a course one foot high around entire building, both outside and inside, and we always aimed to lay a foot each day and raised the planks next morning, ready for another course.

CHERRIES AND PEARS.

BY MR. C. K. SCOON, *Geneva, N. Y.*

Mr. Chairman, Ladies and Gentlemen—I realized yesterday right away that Mr. Wilson had a great advantage over me in his subject and I began to think that I had rather an uphill task. I just want to tell you, rather in an offhand way, of my experience, and if any of you ever want to grow cherries or pears you will have a little of one man's experience, at least my experience in cherries There are two main varieties of sour cherries, the white juice cherry and the dark juice cherry. The Early Richmond cherry is not a desirable variety at all. It is a small cherry, mostly pit and juice and not much meat. With us it used to be considered a very disputed topic as to what is the proper stock to use and there are various opinions. I was brought up to believe that Mazzard stock was by far the best for sour cherries. It is almost impossible for the nurserymen to secure good trees from Mazzard stock. They usually prefer to graft on Mahaleb stock as they take better upon it and the stocks are cheaper.

About ten years ago, I planted one block of trees by themselves, part of Mazzard stock and part of Mahaleb, and on my soil the result was very marked. The Mahaleb bore earlier, but over bore. The fruit was small and inferior. The tree did not made the growth and lacked the hardiness of the Mazzard block. The difference in these two blocks was very preceptible. Anybody going along the road could see where one variety began and the other left off. Mr. Willard tells me that will not hold true on all kinds of soil. My soil is gravely loam.

I am going to give you some reasons why I like to grow sour cherries, and one reason is the beauty of the snowy blossoms Unlike the apple, it blossoms before the leaves start. I go out into my orchard and look up at the wealth of bloom. It is one of the most beautiful sights you can imagine. Looking down along the rows it seems like a mountain of snow, and I go right into the midst of it and look up at the bees at their work and enjoy the delightful perfume. A blind man could get to them if he had any nose. And I say "This is living." I pity the man who has to work inside of brick walls. This is something that makes a man glad that he is alive, and has the faculty to appreciate what nature has done for him.

Another reason for liking sour cherries is, because we rarely miss a crop. This is not the case with peaches and plums. Very frequently we have hopes of a big plum crop. The trees bloom profusely and everything looks favorable, and then there comes a spell of cold weather and the bees do not work in the blossoms. The small plums start to grow a little bit and we begin to run our bu carts and then they all come down and the crop is gone, simply because of imperfect fertilization, but it takes very severe and unfavorable weather to hurt cherries after they once bloom. This year we had a great disappointment in the buds being injured by the frost. They had lots of blossoms, but we are going to learn to look at things. Looking inside the blossoms, we found the petals and the leaves there, but the little man with the red coat and the stone in his throat was missing. In good blossoms we usually find the pistil guarded and protected by the stamen in their yellow hoods and straight jackets. He was missing this year and we said it is all off with those blossoms.

I like the cherry tree because it stands up straight. You are talking here about whether apples should be planted deep in order to make them withstand the wind, but you never saw a cherry tree do anything but stand up right straight. It is straight and strong. It is a long lived tree, but the English Morello is susceptible to the leaf blight and shothole fungus. I spray the English Morello tree two or three times: once thoroughly before the blossoms open; once just after they fall and probably once again if the weather is warm and wet. But the Montmorency I don't spray at all. I have trees that are about twenty years old, that have borne good crops, that I never had to spray and that's one mark in its favor.

I am afraid you will go to planting sour cherries when I tell you they are not attacked by the scale. In my orchard I grow apples, pears, peaches and plums, and the only thing I have not had to spray for San José Scale is sour cherries and Kieffer pears.

I made a mistake in my early planting. I set them fifteen by fifteen, which is too close. When they were about fifteen years old I had to cut off part of the tree, as the under branches were dying in somewhat. I decided to head them back and about six years ago they were cut back severely, so as to form an entirely new head to suit my own ideas. This brought them down within step-ladder reach and the lower limbs are again bearing fruit. Ever since that I have cut back the entire new growth. With my later planting I allow them to reach a height of 12 or 14 feet and I say "stop," and I hold them right there. The lower limbs begin to bear fruit although on the fifteen-foot planting the limbs reach together so that it is difficult to get through without knocking off some of the cherries. I now plant my cherries eighteen feet apart each way.

Now as to picking and marketing. Of course, the picking of cherries is a bug-bear. When we talked about planting so many cherries the question was raised, where are you going to get the help in picking time.

When our first orchard began to bear an old friend came into the orchard and looked up through the rows and said, "Boys you will never pick half of these cherries." Well, of course, it does take a good deal of help, but it comes in vacation time, and we only live two and one-half miles from Geneva, and can get women and children. I think it is all right to stop child labor in factories. I think this country has been cursed with a curse in that matter and I think it ought to be stopped. I think it is wrong to pen them up indoors when they ought to be moving about and stretching their muscles, but I do think it is an advantage to their health, and besides gives them spending money if they come out and pick cherries during vacation time. We have usually about 100 pickers. It is light work and the boys enjoy it. At first I paid by the day, but I have changed to paying by the basket, and I find that it is a great advantage. When I paid by the day, about every five minutes some one would want to know what time it was. "How long is it going to be before we quit?" But since we pay by the basket and use the card system, they are liable to ask different questions. I will hear them saying, "I am going to try to get so many before noon," "Have I time to pick another basket before we quit?" And it sort of cheers them and it keeps them good natured. Some children will pick twice as many as others, and this will cause trouble when we pay by the day. One boy will say, "I am as old as he is." "I am as big as he is if I am not as old." We get the same thing accomplished and it relieves us a great deal. You know the result is what we are after. It doesn't make so much difference how it is done.

Our market for the cherries has been a good one to preserving companies. Probably nine-tenths of the cherries that are grown about our place are sold to the different canning factories. It makes a very quick and easy way to dispose of them. They estimate how many we have. They used to try to buy as many as they wanted. We farmers are not quite as quick to get on to things as business men are, and found that when there was a large crop there was difficult in disposing of what was left, so that now we sell the crop outright, estimating as nearly as possible and the buyer agrees to take the entire crop, be it more or less.

Now a few words about pears. If you have enterprising business men in your locality, one of the improvements in the near future will be the erection of a cold storage plant. The growing of a large quantity of pears will help bring this about, because the storage can be first filled with them and they will begin to move off to market as apples begin to come to take their place.

In planting pears, I should limit myself to a few choice varieties. And first of all comes the Seckel, because it is the standard of excellence the world over. There is nothing that excels it in quality. If I had soil that would grow Seckels a little larger than the average size, there would be no danger of planting too many. Besides being rather a slow, hardy grower, it is not so subject to blight as most other varieties.

The next choice would be Bartlett, a standard variety always in demand and always will be.

The third would be Bosc, a large, late pear, very nice and juicy, equally as good for canning and desert purposes and a good seller on fruit stands.

And I am planting apples. In my slow-growing soil, we claim it takes twenty years to bring an apple tree to perfection. What is the use of your planting apples? Well a man has the satisfaction of doing something that is going to live longer than he does. I have in my possession a farm on which my father spent his life, upon which I was born and reared and I have a boy in Cornell University who is taking the Agricultural Course, and who is ambitious to take it when I get through with it. It gives me a good grip on life to see young apple trees growing and it makes me able to think there will be better apples and better methods for caring for apples than I found in the world when I came into it, and it makes life worth living. Here is an opportunity that makes any farmer boy's life worth living and worthy of the best that there is in him and he is worthy of the best education that you can give him to prepare him for his business. The best crop that a farmer can raise is boys that will start on the farm and take care of the fruit he has planted. making it their life study and their life business.

Question No. 1. What varieties, if any, of sweet cherries do you find profitable?

MR. SCOON: The Windsor without a doubt, is the best shipper, not being so liable to rot as the soft meat cherries.

Question No. 2. How do profits on cherries, sour or sweet, compare with apples, acre with acre?

MR. SCOON: The sour cherries are more regular croppers and will compare favorably with the best apples for profit per acre.

Question No. 3. Do you keep your cherry orchards cultivated all of the time?

MR. SCOON: Thoroughly cultivate until the crop is picked, then seed to cover crop.

Question No. 4. What fertilizer, if any, do you use in orchard (I mean this in the broad sense, not as to brand)?

MR. SCOON: Have used muriate of potash and phos. acid, but have about concluded my soil required nothing but enough barnyard manure to make cover crop grow.

Question. What elevation and character of soil do you find best for cherries?

MR. SCOON: Rolling land, gravelly loam soil; though some sand with a little more fertilizers is excellent. Avoid low and wet land.

Question. How about Question No. 2 for pears?

MR. SCOON: Pears usually sell for more per barrel than apples, but the yield is so much less per acre that the profits are not so large. There are striking exceptions, however, to this statement.

Question. How about Question No. 3 for pears?

MR. SCOON: Pears must be cultivated through the growing season; but if blight appears, stop cultivation to check growth.

Question. What are your best commercial pears?

MR. SCOON: Seckel, Bartlett, Bosc and Kieffer.

Question. How do you handle pears in picking? How do you pack, and when, and how do you market them?

MR. SCOON: Pick in baskets, sort on table and ship in bushel kegs. Bartlett and Seckel are frequently held in local cold storage till the rush of season is over. Canneries here buy most of the Bartletts.

PRACTICAL ORCHARD MANAGEMENT FOR PROFITABLE RESULTS.

By Dr. I. H. Mayer, *Willow Street, Pa.*

Ladies and Gentlemen and Fellow Fruit Growers.—It is with a little diffidence that I come before you with a subject that has been discussed at this meeting a number of times. We in Lancaster county have not as many fruit growers as you have here, in fact, there are only a few commercial growers there. Now Lancaster county produces more agricultural products than any other county in the United States, and while no other county produces a larger quantity of agricultural products, Lancaster county, up to a few years ago, has been producing very few apples to send out of the county. Lancaster city has a population of about fifty thousand. They claim now sixty thousand. We find that we can sell there quite a quantity of fruit of all kinds, apples, peaches, pears, plums and quite a lot of cherries. We ought to grow more cherries. A cherry orchard I believe to be profitable and very easily managed, but before speaking about the orchard management, I would say that the man behind the orchard is perhaps more important than anything else. If a man don't look after his trees and don't take an interest in their growth or do anything of that kind, why he had better leave orcharding alone, even though he thinks he could obtain figures like we have here on the wall. I was reminded while looking at your statistics, of something that happened last summer. We have a well in our orchard so that the men can get a drink of water without losing time and in the pump house over the well some bumble-bees had their nests. They too, are very good things to have around. They are like the honey-bee, work for nothing and board themselves. I came to the pump house one day and found one of the boys making a fuss and I said, "Lloyd, what is the matter?" He said, "The bumble-bees got after me." I asked him, "What did you stir them up for?" He said, "I thought they needed it." I feel that I might be like the boy. I might go away a little the worse for the year if I should stir you up for that is hardly what you need.

There are a good many things that we don't believe that we did believe once. I think it was Josh Billings who said, "I would rather not know so much than to know so much that is not so."

Years ago we looked up to those who edited papers. We believed everything they told us. We were a little like the Dutchman who was on the witness stand. When the judge began to question him he would always start out by saying, "My wife says"—"Never mind what your wife says, what did you see?" "My wife says".. "No! NEVER MIND what your wife says, just tell us what you know." "When I was at George's my wife says"—The judge said, "Never mind what your wife says, but just tell us what you saw and know. Some fine morning if your wife should come in and say the heavens have fallen, what would you think?" "Well, I should think they wus down." The fruit growers don't believe all the editors say now, nor what some people tell them, even if they are scientific men. Every fruit grower ought to be a careful observer. He ought to be interested in his work and work out every problem as if it had never been worked out before.

Cherry orcharding and pear orcharding have been covered by previous speakers, and I suppose you people want me to talk more particularly about apples. I believe that you will pardon me for telling just another little story here to emphasize my belief in proving things. I think this question was propounded by a Greek philosopher. "If you take a basin of water and weigh it and put a fish in it, why don't that fish increase the weight of the water?" Some said it was owing to the air bladder in the fish, others had other theories. One old fellow of an inquiring turn of mind, took his basin of water and weighed it and then put the fish into it and found that it increased just the weight of the fish. We must prove things for ourselves.

In regard to selecting a site for an orchard, I would select a location where there is good air drainage and to be sure whether there is good air drainage, I would want to watch for it at least a year, especially on foggy mornings, to see if there were any pockets where fog collects. I would rather have poor water drainage, naturally, than poor air drainage, because the water drainage you can control artificially, but the air drainage no man can control. Have the site near the railroad to save hauling apples and fertilizer. I don't want a big orchard far from the railroad, because of the expense of hauling. Ten cents a barrel for the hauling adds considerable to the cost of the apples and twenty-five cents a barrel which some have to pay makes more difference and that is an item that helps to change the balance in the ledger.

Then in regard to the soil; I would select, I believe, not the ground that will produce 100 bushels shelled corn to the acre, for ground that will produce that much grain will produce a like growth of wood with large cells that fall an easy prey to blight and other diseases. In our country, we grow a great deal of tobacco. There are farms that have raised $300.00 worth of tobacco per acre, and I know of one case where tobacco has been grown twenty years successively without any change, and land of that kind you hardly want to put into fruit; but there is ground that don't produce a first class tobacco crop, but will produce a first class fruit crop, and it is surer than the heavy ground that will produce the large tobacco crops.

In selecting trees, get those with a good, healthy independent root system.

On one occasion we made root grafts, using roots cut up by the plow in plowing an old orchard. These pieces of roots were cut to, perhaps, three inches and a scion six or eight inches long was inserted into the piece of root, and the whole planted so that only one or two buds were out of the ground. That bit of root kept the scion growing until it formed roots of its own and the resulting tree was practically growing on its own roots. Those trees were a success. I believe Mr. Kerr, of Eastern Shore, Md., uses peach roots upon which he grafts some varieties of plum, planting deep, so the peach roots will die and the plum will be on its own roots. The graft in either case producing practically a rooted cutting, a variety on its own roots. I do believe from our experience that the stock upon which the graft has been set influences the fruit. I would dig big holes for the roots and when the trees are dug out I want them dug with all the roots I can get, no matter if the root is five feet long. Then I want those roots laid in their natural position, but not a way down. Put them about a good furrow depth so that they will have good soil. One of our trees had nine foot roots and made a growth of over five feet the first season. Now I would like to say, the aim is to get as much growth as possible in as short a time as possible; and I almost forgot to mention that when we are planting the trees we pack the ground around the tree and then tramp the soil firmly so that it will hold the root, so that after the tree is planted if the roots are sufficiently large one man cannot begin to pull the tree out. Then we ought to get a growth the first year of about three feet and in that way can gain a few years time. However, from some cause or other, trees get into our orchard that we don't want. No matter how careful you or your nurseryman may be, mistakes will occur, and as soon as you find you have a tree you don't want, top work it either by budding or grafting. Take all the small branches and make a thorough job of it if possible in one year. Select varieties known to succeed in your latitude and soil. Plant a number of varieties as pollenizers and get a crop of apples sometime when the other orchards do not have much fruit. By planting a few varieties new to your neighborhood you may find something profitable for yourself or posterity. There is an apple over there that we call Fink. It is quite a good apple and an annual bearer. I think it originated in York county. Do not plant trees that have been grafted on whole roots. I wouldn't plant such trees if I could get them for nothing, because of the quality of fruit I would expect to get. Each tree would have a different root and be influenced by it.

We aim to get the heads of the trees low down. We aim to get lower than any of the gentlemen here. Sometimes the nurserymen have trimmed the trees up and have to leave the branches as they come out, and cannot cut them back as we would like. Our object in cutting back and heading very low is to make spraying easier, make it more convenient to pick the fruit and to thin it, and, more than all, to hold the trees in case of storm. A tree that is heavily laden with fruit will stand firm like a post when there is a storm as the wind cannot get up under the tree. If the wind cannot get up under the tree there is very little drop. One of our neighbors had his trees headed higher than ours and the ground was covered with apples after a storm. He came over and said, "I want to see how your trees are and there they stand like posts. They don't sway even." This is the greatest advantage of low heads. In regard to pruning. We don't prune as heavy as some. I mark the limbs that are to come off myself. I fasten a small paint brush on a pole, I then take a bucket of venetian red and touch up the branches that I think ought to come off. The men are instructed to saw them off clean and smooth. I had a man working for me who thought he know how to trim. He said, "I can trim your orchard. I know how to trim." When I got out he was at the second tree. He was taking off all the lower tier of limbs. I stopped him right there and those two trees have not got over it yet. They don't bear half as much as others of the same age.

We aim to trim every other year and we have barefoot boys run through every year and take out water sprouts, they grasp them firmly and give them a little twist, which brings them out, root and all, including adventitious buds and by October thay are pretty nearly all healed up.

We aim at clean cultivation. We do not always get it. If weeds get too large for our harrows we use the Oliver chilled plow a second time and turn them under—better late than never. We are not afraid of late cultivation in berries or tree fruits. By slack cultivation you induce a weak little growth, ripened too early which the frost may kill. We never had a branch of apples or cherry or peach killed by winter freezing.

We use commercial fertilizers and we think we get results. We fertilize and trim each tree individually. Some trees don't get more than a pint of potash, while others get three or four quarts. You can know pretty near by the bud development. It is a little like a physician prescribing for a patient, we can attend to it pretty quickly, but do not stop to explain why. It would occupy too much time. We grow peach between the apple trees in part of our orchard and pears, raspberries, strawberries, etc., in the balance.

With cover crop, we have had some experience and crimson clover we have found to be the best thing that we can use, but I don't think that we will try it again except for every alternate year. Our orchards bear on alternate years mainly and after we drove over it six or eight times to spray and again to haul the apples off there wasn't much clover left.

Thinning, we try to do systematically, but it is never done as we would like to have it done. We take off ALL the inperfect fruit. Some pickers have been working for us seventeen years, but even then they leave too many apples. We want all the imperfect apples taken off, and if the tree is heavily laden we want some of the perfect fruit taken off also. Get the apples thinned so the tree will stand the load of fruit, and then take a few more off. There is no use in growing knotty apples. We turn them into cider. We find that we get better results by using women and boys from school. in thinning the apples, than from men, for they will take them off as instructed. We do not claim to have the apples only four or six inches apart. A small pendant branch may have apples touching and mature them. We believe in cleaning out all the defective apples. We have pickers to pick the apples after the fruit is matured. We kept account of cost of thinning and after harvesting the crop we found it only added five cents a bushel to the cost of picked apples. When we came to pick the apples this year we were disappointed. We like to have quite a lot of bushel crates. We had ordered goods from New York State, but did not get them until after the picking was over. This year we tried picking by the bushel. One man picked 115 bushels a day, and I think we got just as careful work then as when we paid by the hour. Three cents a bushel made pretty good wages. There is a mistake a good many of us are inclined to make. When we see a man making pretty good wages we think we ought to cut down the rate. If we have crates enough to put the apples right into the crates and don't let them stand in the sun. We put some of our apples in Pierce-Williams apple boxes. It was work that was new to all our men, and I suppose that in opening the boxes we will find them in not quite the order we wanted them to be. Lancaster county is as near the home of the York Imperial as Adams. York county is their home, but we have adopted them, and our pack is York Imperial.

In regard to sorting and selling. I depend on what the men who buy want. If they want to buy them as they run, we sell them that way. If they want them graded, we sort them to suit, but we won't condemn a York Imperial like these on this plate, or one half that big. It don't pay to send fine small apples to the cider press. There is a certain trade that uses small apples. A great many people want to put little apples in the dinner basket. In our retail trade a great many will buy something pretty for the table or side board. One woman wanted to buy some nice little apples of a bright color to put on her table. She said she used them every week instead of flowers, as they didn't make so much dirt, and it was a change for the table. When they were done she could give them to some of the neighbor's children.

We grow a whole lot of things in the orchard. Perhaps we have been cropping our orchards too heavily, perhaps we have been fertilizing too strongly, but we have always put on more than we thought we were taking off. I was compelled to do something after planting my first orchard which gave me the name of being a mean man. Gunners destroyed our trees by shooting into them, and I put up trespass notices. I believe we ought to keep the trespassers off altogether. I don't want anything in the orchard not necessary. I don't want a loose horse, cow or anything else in the orchard. They will ruin our trees. The trees are down to the ground and the cows will take off two-thirds of our crop. We don't want hogs in our orchard, they too will ruin the low branches. We have no use for chickens in our orchard. We gather up all our early windfalls for cider, and we don't want a lot of chickens to muss things up. There is another point in caring for the orchard. We remove all rubbish about three feet from each tree before the ground freezes in November, and we don't want chickens to scratch it back. We want every tree to grow and every tree to continue growing and fruiting. Ten, twenty or thirty per cent. of the trees missing reduces the crop and may cause a loss instead of a profit. Then in addition to selling the apples in bulk, boxes and barrels, we sold some apples to the cannery that were of a different grade. Then we worked up a lot into apple butter. These different grades amounted to a great deal. Apple butter is worth about fifty cents a crock. and we had about 800 crocks. We can get help in this work for about ten cents an hour. We tried evaporated apples one year, but didn't strike a good market. Now evaporated apples are in demand at good prices. There is always some money in cider, vinegar, evaporated apples, apple butter and apples for cannery. This leaves plenty of good outlet for the different grades of fruit when help can be obtained.

I don't know about the Adams county farmers rushing over to Lancaster county. Good farm land there brings anywhere from $125.00 to $180.00 an acre, and as high as $200.00, where land can be secured close to the railroad. I don't think we are warranted in investing quite that much money in orchard land. Now in regard to the profits of the crop, you can figure that up just as you please. I offered $30.00 for the apples on one tree, but the man would not sell at that price. Now you can easily count thirty trees to the acre and that would make $900.00 an acre. If I would have got those apples, I could have got $50.00 for the apples on that one tree, which would be a yield of $1,500.00 to the acre.

Nearly all apple orchards bearing heavy crops bear on alternate years, yet the orchard should be sprayed every year, and the other expenses on the off years must be borne in mind, so that dividing the income by two will make a showing somewhat too high. Many orchards are unprofitable even both years. Thank you for your attention.

THE HANDLING OF FRUIT FOR COLD STORAGE.

By Mr. Geo. T. Powell, *President of the Agricultural Experts Association, of New York City.*

Mr. Chairman, Members of the Fruit Growers' Association:—The question of handling fruit for cold storage is perhaps one of the most important which we have to consider at the present time. The early history of our fruit growing found us with varying conditions. Times of great gluts in the markets and then very soon after times of great scarcity, without the facilities for holding, which we have at the present time. Our seasons were short and the fruit all had to be forwarded and disposed of in the shortest possible space of time. That resulted in exceedingly low prices for the producer and rather high prices for the consumer, but with the changes of the times, with the increase in transportation facilities, there has come the advantage for storing and holding back very much larger quantities of fruit, which may be, in consequence of the storage facilities, carried over a much longer period of time, and the result has given much greater value to the producer and at the same time is keeping prices more uniform to the consumers of our fruits. There are many things to be considered in the handling of fruit for cold storage. There have been in the past heavy losses, and it is not to be considered that we as fruit growers can depend on cold storage as an absolute means of avoiding loss. Cold storage only furnishes a medium for retarding or holding. The success of the holding will depend entirely on the condition of the fruit. Fruit that goes into cold storage over mature or over ripe cannot be held as long as fruit that goes into storage in prime condition. Fruit that goes into storage in a poor condition is by no means improved in cold storage, but it may be held for a little longer period. For a number of years there have been most serious disputes between the warehouse men and the people who store the fruit. The fruit has not always gone out well and the warehouse man has been held or attempted to be held responsible for the results. You will note that our department in Washington has been making extensive investigations on this line. My son has been very much interested in this work, and it has been a pleasure for me to co-operate with him in the experiments, and my farm with others, has been used in experimental work.

We very soon learned, not only from experience, but from the careful investigations that have been made that the warehouse man is not altogether responsible for the condition of the fruit that goes in and comes out. He must be held responsible only for the control of temperature and the proper handling of fruit in the storage A number of years ago I constructed a storage building and undertook to hold my fruit through the agency of ice. The first holding was with several hundred boxes of Bartlett pears. They went in in very good condition. They kept for several weeks very well, but when the time came for the marketing of fruit there was a very unexpected change in the coming up and ripening of this fruit. Some of it was coming up ripe before the time to ship. We did not understand the importance of getting the fruit in storage as quickly as possible after it was gathered. We had not the facilities for keeping our temperature even, as it should be. In looking back over the experiment, we found records of wide variation of temperature, which was undoubtedly responsible for this unexpected ripening of the fruit. Then again, we must have knowledge of the varieties best suited for holding. All varieties do not hold alike. Furthermore, we must understand about the age of our trees. We have learned by experience and a careful investigation of the matter that there is a difference in the holding of apples grown from young orchards when stored side by side with those of old trees. This is a very important matter for all growers, who attempt to hold fruit to understand. Then again, there is another very important phase of the subject and that is the growing of the fruit, the question of tillage and of sod influence. Apples grown in sod or grass keep better than those grown under tillage. The question of pruning the trees and thinning the fruit was brought out in the discussion of this morning. They are both factors in the variation of maturity of apples. We cannot go over an orchard and pick all of the fruit at one time, and expect the best results from it, because of its varying maturity. Hence, we need to prune our trees that we can secure the largest quantity of fruit maturing at one time, that we may have a strong, even development of the fruitage which will help to produce a greater uniformity in quality. In the beginning we had never thought of these questions in the handling of our fruit for storage purposes. In the experiments which were tried on my own farm among some of the most interesting and valuable lessons I have learned was the importance of careful handling of the fruit. Fruit that in any way becomes injured in handling will have poor holding qualities. In testing this by the inoculation of fruit with the germs of moulds, we had a very striking experience. My son took some of the finest fruit I had and by simply touching it with a needle which had been previously inoculated and then laying it away, although with no visible injury whatever, it very soon developed decay. Simply with the touch of a needle point the apples may become inoculated with the fungus germ. Now the lesson of that work is this, that in handling our fruit, we should avoid every possible occasion in any way of injuring the skin, for when we break the skin, we at once expose the fruit to some germ that is ever present in our packing house, later to spring into activity. So long as we can keep the skin intact, there is little danger of decay. The packing should be done with great care. The emptying of fruit into packages from the picking packet should be carefully done. We always use baskets with swing handles for picking and never a bag, as has been recommended. So many find it, as they say, more convenient to sling the bag over their shoulder. By the consequent movement of the fruit in the bag, the pickers will puncture the apples with the stems, and this is equally true in picking with a basket if they are careless in emptying. We, as fruit growers, have hardly understood the first points of success in the holding of fruit, and if we are going to run the risk of placing it in storage it is very important to us and to the consumers who are to buy the fruit, that it be handled carefully and the more careful and promptly the fruit can be packed and stored after it has been picked, the greater will be the success in holding. Wrapping the fruit is a great protection against germ infection. The fruit keeps better in every way if it is wrapped. All fruit that is used for fancy, hotel or club trade is best wrapped and packed in boxes rather than barrels. The question is properly asked, whether fruit growers should not have the storage of fruit on their own farms. The cost in the city storage houses is from forty to fifty cents a barrel for the season, and from fifteen to twenty cents a box, which of course makes a somewhat high cost on a large quantity of fruit, and the subject frequently comes up, why don't the fruit grower have his own storage? I doubt if it is practicable for him to store upon his farm. He cannot use a mechanical system of cooling. There is a system of cooling with pipes that I think will work out. This is known as the Gravity Brine system, and some individuals have put up very successful small storage buildings.

I think it will be possible for large growers to use the Gravity Brine plan fruit rooms and have a storage on their own farms. I think the better plan would be for a community to establish fruit storage and handling facilities. For instance, take a community like this, here is a large territory that is well adapted for very fine fruit. We have found some excellent fruit on your tables and the Committee has only gone partly through with it. The evidence is right here that you can grow apples of the very finest quality. Now the thing for you to do right here in this section, would be for you to co-operate and establish modern, first-class storage facilities. By your co-operation you can have the advantage here of a storage, instead of paying the higher price that you will pay if you send your fruit to Philadelphia, Baltimore or Washington. You have a better advantage in the disposition of fruit. One of the most important troubles in attempting to store fruit in our distant cities, is in the uncertainty of getting it there in time. Many of our large buyers make great mistakes and have met with heavy losses because of having fruit picked too early. They have been mistaken in supposing that fruit would keep better, picked early. The tendency of the York Imperial has been to scald, much of the fruit having been picked too soon, while those that have been left longer on the trees until fully mature have kept perfectly. When we left the fruit, till it came up to this higher degree of maturity, we learned that it will keep better on the tree than off, that is, after we pick the fruit it begins the ripening process. We can keep our fruit on the tree better than off, and after it is picked it is better to get it into cold storage at once. We are finding great difficulty and perplexity in getting cars promptly to load when we want them. We have ordered cars two or three weeks in advance, and yet in spite of the early filling of the order, have had to wait eight or ten days and after we got the fruit into the car, it was two weeks before we could get it into the storage in New York. Because of delay in getting cars and further delay in the railroad the fruit is exposed to very great risk before being put in cold storage. I have had fruit so delayed by railroads in attempting to get it into storage that it had to be sold immediately on delivery because it would not hold. So that the grower runs more or less risk when he attempts to store in our large cities. There would be a large advantage in having the local storage. There is a considerable and growing interest in this plan. It would insure not only success in storing fruit, but it gives an advantage on the other hand in the labor problem. It is about all we can do to get our fruit gathered promptly and get it into storage. If you had the local storage you could put all your effort in getting the fruit gathered and put away, then after the crops are harvested and you are more at liberty, you can take it out, sort and pack it. In the winter when it becomes cold, we can deliver the fruit in refrigerator cars in good condition. Now those are some of the favorable conditions that are attached to handling fruit for cold storage, and I think in a co-operative way it will be practicable for fruit growers in general to store their fruit. The home demand is growing greater each year, and the foreign markets are also growing in their demand for our fruit. Improvements are also made upon our ocean steamers, the capacity has become so extensive and the facilities for refrigeration so admirable that it is going to be possible to put our fruit in any part of the world where it is desired. But when we attempt these shipments from different parts of the United States, we must have our fruits cooled in some way that they can be delivered to the most distant markets and here comes in to advantage the local storage and the refrigerator car.

We have got to study so much about our business and one of the most interesting features of it is we are always learning. While we have had a large experience in the handling of fruit, I feel that there is much more to know than I have yet learned. There are many new and interesting questions that are constantly coming up. We don't realize the possibilities in the development of our work. I feel we haven't yet learned the alphabet. There are certain markets for which we should grow very attractive and beautiful fruit. There is a demand in Germany for our fine fruit, and France now supplies that market. The French know how to put up their fruit. Their apples are large and beautiful, put up in the very best manner, every apple wrapped and put into single layers and in single packages. They use a small box and put into it possibly two dozen apples, but they will put only one layer in the box. They are not only wrapped but packed in excelsior in addition. Now what does that fruit return to the French producer. He gets usually, from five to seven cents a piece, yet the French apples do not compare in fine flavor with American fruit. Our apples often arrive in poor condition, and unattractive, yet Germans prefer them because they are better flavored, and they choose them for that reason. I am shipping apples to Germany. I use a single box and select the very choicest apples, every specimen perfect, wrap each apple, and in addition three boxes are packed in a case. Now the trouble with our foreign shipments is that the fruit gets very rough handling, when unloaded on the other side, the barrels roll on long runaways, and it is the same with boxes. They jam and crash into each other in unloading and much of the fruit is damaged. American shippers in sending fruit to foreign countries, packing their apples in a box weighing about forty pounds, and in barrels, have met with frequent disappointment from injury from handling of their fruit. Instead of shipping in the single box, three packages have been put in a case and the case securely nailed so that when one case strikes against another the fruit in the boxes will not be bruised. We must not only keep our fruit from becoming over ripe, but when we ship we must put it in a package that when it arrives it will be marketable.

I have given you the main point and the most essential features in storage handling of fruit and shall be very glad to reply to any questions that may occur to you to ask.

MR. ELDON: How do you wrap your fruit?

MR. POWELL: This is the difficulty the individual grower will have to meet to get skillful wrappers to put up his fruit. If the fruit could go to one central point like this there would be no difficulty in getting skilled packers to handle the fruit. I have been able to secure very good help in packing my fruit. Farmers' daughters and those of the people who live in small villages near my farm are interested in this skilful kind of work, and they come every year to do it.

Question. What must you pay for this work?

MR. POWELL: We pay fifteen cents an hour. We can employ wrappers for ten cents an hour, but prefer the better for fifteen.

Question. What do you use to wrap the fruit?

MR. POWELL: We use ordinary newspaper, the white unprinted paper. Sometimes we use tissue paper.

MR. COLLINGWOOD: Is there any difference in the keeping qualities between sod grown apples and clean culture fruit?

MR. POWELL: Our experience has been that there is no difference when trees are of the same age, and all other conditions are the same, but on young trees they will not keep so well from cultivated land.

DISEASES OF ORCHARD TREES AND FRUITS.

BY M. B. WAITE, *Pathologist in Charge of Investigations of Diseases of Fruits, U. S. Department of Agriculture.*

Introduction.

The subject assigned to me by the Secretary is so broad that I am obliged to select from it for discussion some particular branches in order to keep my paper within reasonable limits. For this reason I have selected certain orchard diseases more or less serious in this part of Pennsylvania, and in connection with which there is likely to be more or less interest on the part of the members of this Society. I will, therefore, take up for rather brief discussion, pear blight, on both the apple and pear, apple scab, apple leaf blight and spraying for the same, together with a discussion of russetting due to Bordeaux mixture; also peach yellows, little peach and the brown rot of peaches, plums and stone fruits, three of the leading peach diseases. Each of these subjects for full discussion requires an hour's lecture and I can, therefore, only give you a few important points on each of these diseases.

Pear Blight.

Description.—The well-known bacterial pear blight caused by a tiny bacillus is one of the prominent orchard diseases in this part of the country. It attacks particularly the pear and the apple, but also affects the quince, the Siberian crab apple, the wild crab apple, the Hawthorne, and practically all the fruits of the pome family. The germs producing this disease enter the tree in three different ways: First and most commonly, through the blossoms, being distributed from flower to flower and tree to tree very widely through bees and other flower visiting insects; second, through the tender tips of growing shoots, including the water sprouts at the bases of the trees; and third, directly into the fleshy bark. Infections of this latter type are few in number but result in a very serious form of the blight. The amount of damage resulting from an infection may vary enormously. Thousands of infections simply kill the blossoms cluster or a few inches of the top of a growing twig. On the other hand the blight may run down on to large branches or run clear to the ground, killing the whole tree, or it may spread from a lateral infection, doing more or less damage. The spread of the disease, the number of infections and the amount of extension of the blight on a tree after infection are dependent upon a number of different conditions. The factors controlling an outbreak of pear-blight may be summed up as follows:

First. The presence of the germ and the amount of holdover blight available for reinfection.

Second. The amount of bloom on the trees. It is difficult for young orchards to catch the pear blight until they blossom.

Third. The number of insect visitors available. This is largely, however, constant if the next is favorable.

Fourth. The weather during blossoming time. If the weather is favorable for insect activity and nectar secretion, the blight germs are generally carried about. On the other hand rainy weather or cold, dry, sunny weather discourage the spread of blossom blight.

Fifth. The variety and species of the tree. Each different horticultural variety and each species of pomaceous fruit has a different relative resistance to the disease.

Sixth. The age of the tree. Young trees are more susceptible than older ones. The most susceptible age comes at the time the trees are first in bearing, say the first four or five years they are in bearing.

Seventh. The vigor of growth. This is influenced by fertility of the soil, soil moisture conditions, favorable weather, artificial manuring, fertilizing and cultivation. In general, those conditions most favorable to vigor of growth of the tree are most favorable to the blight, and conversely those influences which dwarf or check the growth of the tree tend to hinder the progress of the blight.

Most of the blight dries out in the trees during the summer. On the other hand, occasionally at the bases of the blighted twigs or more commonly on the thick fleshy bark on the large limbs and on the bodies of the trees, the blight keeps slowly progressing until the close of the season. The germs die out in the dead bark, but keep alive on this advancing margin and the cool, moist weather of winter, though it checks their growth, tends to keep them alive until spring. This type of blight we call "holdover blight" and is the source of the new infections each season when the trees spring into growth.

Collar Blight.—I wish to call particular attention to collar blight at the bases of apple trees of this State. I saw some very remarkable axamples of this in the orchard of Mr. D. Maurice Wertz, at Quincy, Pennsylvania. Pear blight is able to attack the thick bark of vigorous young apple trees at the soil line and produce a sort of collar girdle. The terms enter also through water sprouts, or by means of the punctures of insects, or through growth cracks directly into the fleshy bark. Once in the fleshy bark, the germs spread out on to the roots and up the trunk of the tree. Frequently a large irregular area occupied by the blight germs entirely girdles the tree at the soil line, thus absolutely killing it. Trees so affected usually take a year or two to die and sometimes the blight has all dried up before the tree actually dies. The seeding stocks are often more susceptible to the blight than the grafted top of the tree. At any rate some lots of French stocks are probably much more so than others. The seedling stocks are, of course, an absolutely unknown thing, as to their susceptibility to blight. With our horticultural varieties, which constitute only the upper half of the tree, we have learned by years of experience how they behave when attacked by blight.

It should be noted that trees injured or dying with blight at the collars and on the roots behave not unlike those affected by other troubles. In fact such trees die in very much the same manner as a tree dying from root rot. This fungous root rot is rather abundant in apple orchards of Pennsylvania as well as other Eastern States. At least two types of frost injury also very closely resemble pear blight at the collar. In one of these the tree is injured from the soil line upward, usually on the sunny side but not always so. Blight is easily distinguished from this winter sun scald when the latter occurs as an elliptical area on the main trunk of the trees from the soil or snow line nearly to the branches. On the other hand another type of frost collar girdle reaches but a little above the soil line or only occasionally extends upward in a v-shaped area but spreads well under the ground, partially or wholly girdling the tree. Still another type is that of root winter killing. In this case the roots near the surface of the ground are frozen and killed, while the top of the tree may or may not be injured by frost. It is necessary to know these other collar injuries in order to distinguish them from true collar blight.

Treatment.—Referring again to the factors influencing pear blight, it will be noted that the presence of the germ is of primary importance. If the pear blight germ is not present in the orchard or in the immediate vicinity there can be no blight. When spring opens up and new growth begins, if the germs are present or conveniently nearby, and the conditions favorable, blight has a great opportunity to spread and accomplish its work of destruction. If, on the other hand, the germs do not occur, no matter how favorable conditions may be, there can be no blight. The main method of controlling pear blight is to cut out the holdover blight. This is usually best done in the autumn but it may be done at any time through the winter or early spring before the blossoms appear. When blight occurs on the main limbs or on the collars of the trees, one of the principal things in combating the disease is to find all the cases, especially where the blight occurs under the rough bark. It requires close examination to find and remove all the blight in the tops of the trees, but this can best be done in the summer or early in the autumn while the foliage is still on, the blackened dead leaves enabling one to easily locate the blighted branches. Summer cutting out of pear blight must be regarded, however, as of secondary importance in the treatment, though still a good thing to do. On rapidly growing twigs and branches it is usually necessary to cut a foot or more below the lowest discoloration of the bark. In winter pear blight cutting, it is usually possible to cut pretty close to the blight, say four to six inches, or, where it has thoroughly died out an inch may do. On the other hand when the blight blends off imperceptibly from the dead bark into the live bark, as it often does in summer, from one or two feet below the lowest point may be considered necessary.

In all work of cutting out pear blight, a disinfectant should be carried to sterilize the tools and cut surface. For this purpose, one of the most convenient germicides is a 1-to-1,000 solution of corrosive sublimate. A bottle of this can be carried in the pocket and a sponge, tied to a string, kept saturated with this solution. After trimming out the blight or removing the blight bark from a diseased area, the cut surface as well as the instruments should be sterilized before turning to another infection. It is possible with proper tools such as a gouge, draw shave, or box scraper, or better a specially made scraper, to remove the bark from a blighted area, disinfect the surface and thus save a large limb or the trunk of the tree instead of removing the same. All small limbs which can be easily spared should be cut out in removing the blight. The object of the treatment of pear blight is to cut all blight from the trees and save all the healthy parts that can be saved. Blight completely kills the bark of that portion of the tree which it reaches but leaves the rest of the tree wholly uninjured. The only exception to this is where the girdling effect is produced by the blight at the collar or on the branches. Very few orchardists in the east thoroughly know and understand pear blight. It has been with them so long that they regard it as one of the inevitable troubles of the pear and in fact the apple as well. Still less generally known are the modern methods of controlling this disease by eradication.

Apple Scab.

One of the commonest apple diseases in America and an injurious one in this section is the apple scab caused by the fungus *Venturia inequalis*. This little fungus is reproduced by spores which germinate on the flower bud, young fruit and foliage of the apple, doing more or less serious damage according to the season, variety and locality. The apple scab fungus requires moist, rainy weather for its propagation. The spores are probably blown very generally about by the wind. Infection periods or times when the spores can germinate and enter the little fruit occur only at certain intervals; that is, it is necessary to have periods of moist, rainy weather for the infections to take place. The degree of humidity in the air, and the length of time that such a humid period, with its drops of rain or dew on the fruit, lasts, determines the severity of the attack. On the other hand, dry, sunny weather discourages or entirely prevents the entrance of the scab fungus into the little fruit. Apple scab, therefore, is an extremely variable disease. It also varies greatly in different sections of the country. It is most severe in the regions of the Great Lakes. It is also very destructive in New England, New York, down to Virginia, and as far westward as Kansas and Missouri. Its destructive effects, however, diminish toward the southward and westward, entirely disappearing in the arid regions. Again on the Pacific Coast, in the more humid parts of California, Oregon and Washington they are subject to the scab fungus and the related disease on the pear during the rainy spring months. Where the apple scab is severe, as it is in the Great Lake Region, the full treatment consists of about five sprayings. It is useless to spray the trees before the cluster buds open exposing the individual flower buds. The first treatment should be made after this occurs and when the individual flower buds are exposed so as to catch the spray. The second treatment should be made as soon as the petals have fallen, or while the last petals are dropping. The third should be made seven or ten days later. The fourth two weeks after the third, and the fifth two weeks after the fourth. This treatment is so expensive and requires so many sprayings that it is only practicable in orchards that are otherwise successful and where good crops of fruit are at stake. I saw an orchard in Western New York this season of 600 trees that was given practically this treatment and the fruit from these 600 trees was sold for $7,480, delivered on the packing benches. There is little likelihood that any variety of apple may be so severely attacked in this country as to require full treatment. The question then comes up in each locality and with each particular variety as to what treatments should be left out. Naturally the grower wishes to spray as little as possible and secure commercially successful results. Ordinarily the first and second treatments are the most important. Probably in this country most of the infection is the early form of scab, preventable by these early treatments. The second treatment, just as the petals have fallen, comes at exactly the right time for the first spraying for codling moth. This spraying is in fact necessary against this insect so that with the addition of arsenate of lead or Paris Green to the Bordeaux mixture is accomplishes both purposes. In fact this spraying is so important for the codling moth that it may be considered that the Bordeaux mixture is being added to the arsenate rather than vice versa. (I mention this insecticide incidentally as a part of the orchard scheme of spraying, but wish to say that my own investigation work in the Bureau of Plant Industry does not include insects and their treatment. This is the work of the Bureau of Entomology.) In the same way a later treatment for codling moth is desirable about three or four weeks after the petals fall. This brings it up to the time of treatment No. 4. It is, therefore, particularly desirable to make a spraying at about the time of No. 4 with the combined Bordeaux mixture and arsenate of lead. The standard formula for this mixture can be considered as 5 lbs. blue stone, 5 lbs. lime and 50 gals. of water, to which should be added about 2 lbs. arsenate of lead.

Where apple bitter rot occurs, later treatments are required. beginning about the time of No. 5, and three or four treatments. according to the severity, at intervals of from two to three weeks during the summer are necessary for the prevention of this disease. I believe, however, this is not common in Pennsylvania.

Apple Leaf Blight.

The apple leaf blight caused by various fungi, particularly that caused by *Sphaeropsis malorum*, is very common in this vicinity. This is very easily prevented. Where this disease occurs alone and to be treated individually, one or two sprayings with standard Bordeaux mixture will suffice. Where a single treatment is made, it should be about 30 days after the petals fall and when the trees are in full leaf. Where two treatments are made, the first should be applied two to three weeks after the petals fall and the second a month later. The advantages of two treatments consist of a more timely covering of the early foliage and the later at which the second is made gives an opportunity to cover the later formed leaves. Leaf blight is so easy to prevent that usually the treatment for scab. especially when Nos. 1 and 2 are supported by Nos. 4 and 5, is amply sufficient to prevent it. In the same way the treatment for apple bitter rot when begun early enough suffices for the treatment of leaf blight. I wish to emphasize the importance of a study on the part of the orchardist of his varieties and their relative susceptibility to disease. For instance the Winesap and its seedlings, Stayman Winesap, Mammoth, Black Twig, and Paragon, are very susceptible to scab. Where scab occurs at all they are likely to be attacked. Probably in this county it will pay, in fact it will be necessary, to succeed commercially with these varieties, to spray the Winesaps with at least Nos. 1 and 2, and probably with Nos. 1, 2 and 4 for apple scab. On the other hand Winesaps have so little bitter rot, even in the worst districts, that it scarcely ever pays to treat them for this disease. Again, York Imperials have so little scab that is probably would not pay to give them even the abbreviated scab treatment. It is doubtful whether it would pay to spray York Imperials for scab at all unless you add an arsenical to treatment No. 2 when the petals fall, giving the combined codling moth and scab treatment. Three or four weeks later, at the time of No. 4 or 5, it can be given the combined codling moth and apple leaf blight treatment in the shape of a single spraying. With the Ben Davis variety, I am in doubt. Some years it scabs early and badly enough to be worth while to spray. At other times, it scabs scarcely any. It is, however, very susceptible to the leaf blight fungus and is nearly always benefitted by a Bordeaux mixture treatment after the leaves are fully out. This, of course, can be worked in at a time when arsenical spraying is necessary for codling moth. It is necessary, therefore, to know the full set of diseases of each variety, and in fact, each variety in each locality of our great country, and to establish the most economical treatment for that variety in a particular locality. In past years there has been a great deal of effort put forth on the part of pathologists and investigators to persuade the orchardists to spray with fungicides and insecticides in combating these pests; but no greater mistake can be made than to recommend wholesale and promiscuous spraying for the whole line of fungus and insect pests on all varieties in all localities.

What the orchardists want is to get the maximum results in preventing these troubles with the minimum expenditure of time and money. He should make a special study, therefore, of each commercial variety of fruit which he grows and its diseases and insect pests. If help is needed in determining the nature of these troubles, specimens can be sent by mail to the Department of Agriculture, at Washington, D. C., or to the nearest Experiment Station and thus identified. Very frequently a State official or a local inspector can be called in who knows the disease and its cause and the exact treatment in the given locality. The particular diseases, therefore, attacking each variety, time or their appearance and their relative severity or abundance should be known by the orchardist. He should then determine by his own experience and by the advice of experts the least amount of spraying that will be sufficient to protect his trees under his conditions. It is particularly desirable to correlate and combine the spraying for the insect pests and the fungous diseases since the same spraying may distribute both materials.

As a rule, where a fungous disease or an insect pest stands in the way of successful crops, it will pay handsomely to do the necessary spraying to prevent the same. This is especially the case where the pest or combination of pests preventable by spraying constitute the only unfavorable factor present. Where the orchardist has done everything else in planting out the orchard, and caring for the trees by cultivation, fertilizing, manuring, pruning, etc., and then loses his crop through apple scab, or has his trees weakened in productiveness by the leaf blight fungus, or has his crop ruined by insects, it will pay many times over to remove this last unfavorable condition. On the other hand there have been some troubles connected with spraying, particularly the russetting of the fruit, which, unfortunately occurs in certain wet seasons even though the best of materials have been used.

Russetting.

A great deal of the trouble in the russetting of apples through spraying has been caused by copper sprays or by arsenical preparations containing free arsenic. Even the best of the arsenicals, namely, the arsenate of lead, from this point of view, has not always proven safe, as some preparations, in certain localities and in certain seasons have proven poisonous. Bordeaux mixture, on the whole, is one of the least injurious of fungicides. When badly made with an excess of copper or with air-slaked lime, it is quite likely to prove somewhat injurious. When properly made it is usually perfectly harmless; but some seasons, especially when there are unusually prolonged periods of moist weather with dews and fogs, it has russetted the fruit. Strange to say, the thick skinned Ben Davis is the most susceptible apple to this russetting and it responds by making abnormal puffy growths to the injury on its skin. Copper and arsenical poisoning also frequently affect the foliage under the same conditions, namely with prolonged moist and foggy weather. This past season a great deal of trouble in the way of leaf fall occurred on the apples all over Pennsylvania. A large part of this, however, was physiological and leaves dropped not only on sprayed trees but on unsprayed apple trees and on other fruit and shade trees. This, it seems to me, came from the abnormal spring. The foliage developed in our very cool May was apparently unable to stand the hot spell which came late in June and early in July, varying from hot, rainy weather to hot, dry weather. The possibility of having more trouble from russetting of fruit is a still further argument, aside from the injury to the pocketbook, against over-spraying.

Peach Yellows.

There has been a great deal of trouble over peach yellows this year. In fact a large area, including the State of Connecticut, Southern New York, Pennsylvania, West Virginia and a portion of the State of Virginia has had an unusual attack of yellows for the last two years. This recent outbreak of yellows is one of the most severe that I have ever witnessed. If it continues unchecked, it is likely to put an effectual damper on peach growing in the area mentioned. In Western New York, and in the State of Michigan the yellows is being fairly well controlled and has not behaved unreasonably for the last few years. However, in some parts of the Michigan peach belt, where the growers become somewhat careless, large blocks of trees were lost from this disease. Peach yellows has been considered by us the easiest of all orchard diseases to control. However, it is the most exacting in its requirements. Thorough eradication, namely, the rooting out of all diseased trees as soon as they have developed visible symptoms, is the treatment of this disease. A tree to tree inspection at least three times a year is necessary for successfully finding the diseased trees. One should be made in July, one in August and one late in September, or during the first part of October, shortly before the trees shed their leaves. This procedure is well known to peach growers over the eastern part of the United States, yet the curious and unexplainable fact remains that only a very few of them put it into practice. Go into almost any district where yellows occurs and you will find everywhere about affected trees, usually in all stages from recent attacks to those two, three or four years old. Yellows behaved unusually during the last two years. Certain symptoms or certain forms of the disease which have been comparatively rare have become the prevailing forms in some orchards. For example, the flesh of the fruit is usually red spotted, especially when it is all over the tree, the foliage begins to show signs of yellowing and drooping. However, occasionally it has been observed in the past years that trees with typical red spotted yellows fruit still carried dark green normal foliage, or perhaps abnormally dark to some extent. This disease occurred in New York and Pennsylvania in many orchards when a majority of the trees were affected in this peculiar and heretofore considered exceptional way. Another form of yellows that is somewhat exceptional is that which, instead of having fruit red spotted, has it prematurely, rather watery in texture and scarcely spotted at all, with only a few spots or red flecks in the flesh. This occurred in Southern Pennsylvania and there were all grades of trees, making it almost impossible to draw the line between diseased and healthy specimens. A third unusual symptom consists of the drooping and curling of the leaves, even of those on the end of the branches, slightly or not at all yellowed. Nearly all the yellows trees, especially on the younger and more vigorous trees in Maryland, New Jersey, Pennsylvania and Connecticut this year, had a peculiar droop and curl of the leaves, heretofore commonly regarded as a symptom of the little peach. In fact this drooping and rolling upward of the margins is so common on peach trees as they approach normal leaf fall at the end of the season that here again it becomes very hard to draw the line between trees prematurely curling and ripening and those doing so normally. Curiously enough these twigs with the drooping leaves have very little tendency to throw the characteristic bushy or wiry sprouts which is so prominent a feature of the yellows. Last year in Maryland, West Virginia and Virginia, the yellows' trees everywhere sprouted abundantly late in the season. This year exactly the opposite occurred in most orchards. Whatever sprouting I saw was mainly in midsummer and the drooping foliage rather than the sprouts became the conspicuous symptom in late September or early October. Nevertheless in spite of these slight peculiarities the standard symptoms of the yellows may be given as follows: Premature, red spotted fruit, bushy or wiry growth on the twigs, accompanied usually in the early stages and always in the later stages, by the yellowing and slight dropping of the foliage. When trees are in fruit the premature red flecked fruit is usually the most definite and recognizable symptoms. An expert, inspecting for yellows, can easily learn, however, to recognize the foliage symptoms either of non-bearing trees or of those after the fruit is off so as to insure their removal without waiting for another year. Exceptional or mild cases only need cause him to be in doubt.

Little Peach Disease.

The little peach disease is in many respects similar to the yellows. As a result of considerable investigation work the writer concluded it belonged to the yellow group. Its symptoms, however, are mostly different from yellows or even the reverse of yellows. On the little peach disease, as its name indicates, the fruit is reduced in size. It varies from two-thirds to one-half to even one-quarter the normal size, according to the stage reached by the malady. The fruit is also belated instead of premature. The belating may occur from three days to nearly a month. Usually on trees recently affected they are about a week later. Trees affected with little peach rarely throw bushy sprouts and only when they are cut or frozen back so that new growth is stimulated. Even then the new growth is not wiry and slender to the extent it is on a tree affected with yellows. Trees affected with peach yellows often fail to throw the wiry sprouts. Trees affected with little peach have the drooping and inrolled leaves similar to peach yellows; in fact have the foliage symptoms that have been so common to the yellows during the past year. As a rule trees affected with the little peach die more quickly than those affected with yellows. Ordinarily a little peach tree dies in about three years, while the yellows' tree dies in four or five years. Little peach is controllable by exactly the same methods as yellows, namely by a tree to tree inspection and prompt eradication on the appearance of the first visible symptom. Occasionally it is hard to determine whether an individual tree has the little peach or the yellows, especially when not in fruit. Sometimes apparently both diseases occur on the same tree. In ordinary orchard treatment, it is not necessary to distinguish these two diseases as the tree should be rooted out in either case. Every tree affected with peach yellows or little peach allowed to remain in the orchard becomes an infection center, distributing or likely to distribute the disease to all the trees around it.

DWARF vs. STANDARD TREES.

BY MR. GEO. T. POWELL.

As our country grows and develops in its industrial interests and particularly in wealth, there comes a constantly increasing demand for products of higher quality, better clothes are required to day than used to be, a higher quality of milk and butter, finer poultry is in demand and when we come to fruits, finer fruits are wanted. And this high quality demanded, brings out the necessity of the introduction of better methods in the production of all these things. In addition to this, we fruit growers all find ourselves perplexed with the ever increasing problems and expense of fighting insects, hence we are forced to consider the most approved methods and variations in the type and form of the trees with which we are working. We realize that there is an increasing difficulty in attempting to control insects upon the old type of large, high trees. Then again we cannot produce upon these large trees the quality which is demanded at the present time. That is, on the old standard trees, there is such a large proportion of inferior fruit which we are obliged to handle and dispose of, but which is not wanted for the most valuable trade. This has produced a new interest in the question of trees of a smaller type, and for several years I have been working along the line of cultivating dwarf apple trees. This is a new type of tree to our country, especially from the commercial standpoint. Dwarf trees have been cultivated for a number of years in private grounds and gardens, by city men having the means with which to adorn and beautify their homes. But nowhere in our country has the dwarf been planted for commercial purposes. The question arises with you, what is a dwarf tree? The dwarf tree of which I am to speak this morning is grown more largely in Europe. They are found in different types and sizes of trees. There is what is known as the Paradise tree, grown both in France and England, which represents a strictly dwarf tree. Then there is the half dwarf, the Doucin, which grows larger than the Paradise. We have the same distinction in apple trees in our own country. We will find in the pasture and woodlands native small trees that are dwarfed in character. They are native wild seedlings, and are trees of diminished size. It is a dwarf for the reason that its roots are small and do not extend in growth. The tree is not supplied with the same amount of nourishment, hence getting a less supply of food the tree is checked in its growth. The quality of the fruit upon the dwarf tree is rather finer than that upon the standard. As there is a growing interest on the subject I shall be glad to give some points of information such as I am able to give. The subject is new and we know comparatively little about it. We have much to learn about the dwarf trees the same as we have about the standards.

We must learn the methods of handling and culture, and I can only give you this morning points from a very limited experience. The general opinion is that there is no profit in them. We talk with nurserymen who say, "There is no profit in this class of trees, they are merely playthings. The man who makes money don't want to have anything to do with the dwarf trees." There has been no one to go ahead and demonstrate their value commercially. As I look forward to the future with the San Jose Scale sweeping over the whole country, I see that the future of the apple culture of this country will have to be placed on a different basis from that which it has occupied in the past. The old orchards are steadily passing out. I can mention instances in New York State where whole territories are practically ruined by the scale. In portions of West Chester county I think I am safe in saying that 75 per cent. of old orchards are useless and practically dead at the present time. On Long Island the same conditions exist, and the old orchards have largely passed away. We shall see the old trees going out steadily before whole communities wake up to the fact that they are losing them. We are by no means at the end of insect troubles. We have the Gypsy and Brown Tail moths threatening all of New England. Our international trade interests have become so great that we are constantly in danger of importing new pests to our shores. I have been over thousands of acres annually for the past three or four years around the surrounding districts of Boston, to see the work of these destructive moths. They are extending into the State of New Hampshire. They are being held at bay, but they may sweep over the country in time just as the potato bugs came to us from the West. It is a law with these insects that they extend and spread rapidly in a new environment and we have a right to look for this. This has given me special interest inthis low type of trees because when we can bring them down to a height of about twelve or sixteen feet we have something that we can absolutely control. My judgment is to-day that if I were to start again the planting of 100 acres of land, I should consider seriously throwing out the standard trees. Dwarfing the standard trees is done by a system of summer pruning, producing in effect standard dwarf trees. I have one block of standard trees that has been planted with reference to this system of dwarfing. These trees were planted at a distance of forty feet apart each way. We then interplanted with trees at twenty feet. The entire block is being pruned so as to repress the growth. Some very important questions arise here as to how far the system should be carried. We must have sufficient room for bearing capacity. This is an entirely new and different kind of work and the only thing we can do is to be our own experimenters and arrive at the correct methods as soon as we can. Hence, I can only give you suggestions along this line. Now let me give you a few points of illustration on the blackboard in regard to these dwarf trees. In the first place the question arises, where can we get them? We can get the stock through nurserymen. They will import them or you can get them through importers of trees and plants. My first trees, I started from the imported stocks sent from England and France.

and they came to me as what is known as the root stocks. They are from cuttings that are rooted. They grow from spring until August. In July or August we insert a bud just above the ground. We take the buds from the varieties we want and put the bud in here at this point. The next spring the top of the tree is cut off and we have the tree started with any variety we wish to grow. This will grow and throw out a few branches the first year. We must keep in mind that we are dealing with a dwarf tree. We want to keep in mind that there are different forms of training these trees. They are trained in all sorts of directions. The trees may be grown in this form on trellises. This is called the espalier system of growing trees. In gardens we can see these trees trained with their branches running out ten feet. They are very attractive and interesting, and it would be well for every family to have in the garden one or two of these trees and let the sons and daughters on the farm have these trees to work with. This type of tree would be of special interest to the young people. There is another form that you can train up. I want to speak along the line of orchard planting. The form which I have adopted is what we call the bush form, which reduces the labor. My aim has been to get a tree that will give the largest possible bearing surface. Here we start out with the branches in this form trying to keep the tree in an open or vase form. This system can be easily controlled in its pruning. Remember that we have here a light rooted tree, and we must not let the tree get too large in the top. We made one mistake right in the start. We did not plant the trees deep enough. The point where they were budded should be under the ground. In the summer when the trees are loaded with fruit, wind storms will blow them over. I am taking these trees up and having them set down deeper. The bud or point of union should go down at least five inches under the surface and then I think they will stand all right. If it occurs I shall not object to the natural apple throwing out some of its own roots. We shall still have the influence of the dwarf roots on the trees. By summer pruning we may keep them dwarfed even though roots may start above the bud. There is danger of the trees breaking off if budded part is set too high. I think if trees are set four inches there would be very little danger with rooting from the apple stock. In my case when I found that we had planted too shallow, we plowed around the trees and banked them up. This is the general line of treatment. I am growing the two types, the Paradise and the Doucin, and the more I learn about these trees the more I become interested. We don't know what we can do in this direction, but my opinion is that we can plant so many more trees to the acre that they will be equal in value to standard. If we can produce a reasonable quantity of high grade apples that will bring higher prices, we shall make just as much money as from standard trees of larger size.

In regard to the distance of planting: My first plan was to plant standard trees forty feet apart each way, then to interplant with the Doucin or half dwarf twenty feet and interplanting again with Paradise dwarf at ten feet apart. We can get 430 trees to an acre. In England they plant acres of these trees from six to eight feet apart. My idea is for us not to try the very intensive European methods. We want to reduce our system to the least possible expenditure of labor, and if we attempt too much, none of it would be done well. I want to hold the standard trees as an absolute certainty and them interplant with the dwarfs. I would abandon interplanting peach, cherry or plum trees, but plant apples with apples only, as then the spraying and culture would be adapted to all of the trees. The danger of interplanting with other trees is when we have to contend with diseases. If we spray apple trees with Bordeaux mixture, we will run the risk of injurying the foliage of peach, plum and cherry trees, and I have thrown out entirely this system of interplanting other kinds of trees with apples and use the dwarf trees instead.

Now the question of pruning comes in as a very important part of this work. So far we are able, we will do our main pruning in March. We cut out the leading branches that are inclined to grow up in the center. We take out the tops of these trees to keep them in low form. We cut back and in and follow annual pruning in March and July to keep the trees in compact form. We want the branches to come out as low as possible, fifteen inches from the ground. We don't want the fruit up where the wind can blow it off. We want our bearing branches strongly developed from above the middle down to about fifteen inches from the ground. It was most interesting to go out and watch these dwarf trees in a storm. While the standards in the same orchard dropped their fruit heavily the dwarf trees scarcely lost an apple. The wind was blowing over the top of them. The thinning on this class of trees is practicable. I have been able to get the trees about fifteen feet high, thinned at a cost of from twelve to fifteen cents a tree. The thinning of the standard tree cost anywhere from thirty-five to forty-seven cents a tree. There is also a great difference in the cost of pruning high and dwarf trees. So that the matter of thinning the fruit and pruning the trees is easily solved on trees of this character. You can readily see every imperfect apple and with clippers you can readily cut off the imperfect fruit. The fruit is thus uniform in size and quality and of a suitable grade to go into boxes. In the markets at this time of year at Philadelphia, New York, Boston or Chicago we will meet the most attractive fruit from the West put up nicely. The eastern fruit grower is hard pressed with western competition. I find it exceedingly difficult to get the fancy trade for eastern grown fruit. I go to the dealers and say to them, "I have Hudson River, Northern Spies and Tompkins County King that I would be very glad to have you try." These men say, "We don't want them. We never know what we are going to get." It is very difficult for any New York grower to attempt to get his fruit taken by the best trade. One of the most difficult things an eastern fruit grower has to do is to get his fruit introduced, and yet we know that our fruit is better in flavor than anything that comes from the Pacific Coast. We have the same competition to meet in Europe as in our own markets, so that we will be more and more forced to consider the types of trees, that will produce fancy fruit. Trees about ten years old that have been thinned, one-third of the fruit having been taken off, yielded three barrels. On the larger trees we would get about five barrels of fruit, but they would not be of the same grade. When we get five barrels from the larger trees, we do not get as much high grade fruit as we do from the smaller trees. There is great difficulty in getting workers to thin the fruit properly. They twist off the apples with the finger and thumb. On the dwarf trees they can stand on the ground and reach the fruit readily.

Question. When is the thinning done?

MR. POWELL: About the middle of July for winter apples and then go over again in August and take off all that is not perfect.

MR. WILSON: Do you have much June drop?

MR. POWELL: June dropping is not experienced in Eastern New York as it is in many places.

Question. How do you thin peaches?

MR. POWELL: In thinning peaches, we leave none nearer than six or eight inches apart. The only way that I can get peaches thinned properly is to get women and children to do it. Men won't do it properly, for they think it is a waste.

Question. When do you begin to prune young trees?

MR. POWELL: In regard to the standard trees about three years old. We do the pruning in the summer rather than in the spring. I believe it is going to be possible for us to hold our standard trees down to a very much smaller size by summer pruning. Understand that when the tree is fully grown or mature, if we prune it in the summer we can give it a decided check. I think it is best to begin with young trees. It we start young trees by taking out the upright limbs we can dwarf them to a certain extent.

Question. What height do you head trees?

I like standard trees started about two and one-half feet from the ground. The Rhode Island Greening and King about four feet Then keep the tops cut out. I believe that by cutting out, we shall not produce so many apples but all will be better quality and a greater number of barrels or boxes of perfect fruit. We aim to prune the center out and let the sun shine down through the trees.

I have given you in outline as much as possible and suggestions along this line of different managements of apple trees of both the dwarf and standard.

WORKING PLANS OF THE NEW YORK STATE FRUIT GROWERS ASSOCIATION FOR CO-OPERATION.

BY MR. T. B. WILSON, *Halls' Corners, N. Y.*

Mr. President, Ladies and Gentlemen.—I have been asked to tell you something of the working plans of the New York State Fruit Growers Association for co-operation. I am sorry to say that some of them seem to have been failures, but perhaps you can learn as much from the failures as from the successes. The benefits of co-operation, or association, as both are one and the same thing, as we will use the term (the New York State Fruit Growers adopted the latter), have been recognized by mankind at all times and in all places. It has been offered as a cure for all social evils and as a means of producing general prosperity. All associations have had their troubles and ours is no exception.

The co-operative work in our association has accomplished much and our principal success has been with the crop reports. In July of each year we send out an inquiry to every member as to the prospect of the future crop of apples, pears, peaches, plums, quinces, grapes, potatoes, beans, and cabbage, asking for their judgment of the crop as compared with last year's crop, also compared with a normal crop represented by 100 per cent. These blanks sent out ask us to give our estimate in percentage. It is a very perplexing matter to adjust. The majority of the members remember better what they had last year and can compare the coming crop with last year's crop better than they can compare it with a normal crop. Then in one county of the State they say the crop will be 200 pr cent. of last year's crop and that county probably does not furnish 1 per cent of the crop of the State. Another county like Orleans or Niagara will report 50 per cent. of last year's crop, and to strike an average from those figures will give you a misleading report. Again if you get our figures from last year's crop, it is of no use to other states which make their reports from a normal crop. You can see by these examples how difficult it is to get a correct report. Some men will always report their crop below what they know it is going to be, thinking thereby that if the crop is reported low they will get more for it, while we always ask for an honest estimate. Some reports we have to discount. By working out these reports and striking a balance we have been able to give to the members the best information obtainable, and these reports are made up about four times each year, July, August, September and October. In the September and October reports, we ask for the prices (if any have been offered), from the different sections. And by these reports the members can form a fair estimate as to what price they ought to obtain for their fruit. Take as an illustration the price of apples. For several years the Apple Shippers Convention have met, and made an agreement to pay about such a price for apples and would cause to be published a statement as to the probable amount of apples, and it is said that in at least two of these conventions they have made up two reports, one for publication and one for private use. Whether this is true or not I cannot say. The dealers congregate and make their headquarters in some city or village centrally located where they can talk and agree on something definite as to price, and almost every year (if not every year), since our association was well established, we have forced the dealers to raise their price from twenty-five to fifty cents per barrel above what would have been obtained had we not been organized.

While at the Buffalo Exposition I met Edward Van Alstine. He had just sold his apples; he told me all the particulars of the sale. Two days later I was at work at home when the buyer drove in and wanted to buy my apples. He told me how cheap they were buying down along the Hudson. I said to him, you paid Van Alstine a good price. He looked surprised. I said. "If you had not put on that six cents per barrel extra you would not have bought them." He said, "How do you know all this?" I said, "By being a member of the N. Y. S. F. G. A."

The Association also has made money for its members by the purchase of chemicals. But purchasing in carload lots, we were able to get reduced prices, which saved many dollars in the aggregate. In the fertilizer trade, we have had some years of success and some of failure. When we were able to get an early contract with some reliable company, we saved the members $2.00 per ton and sold as high as fifteen hundred tons, but we found it difficult to always get a contract. The Executive Committee would arrange to meet some agent who would give us figures, but there was always something that had to be submitted to the company which would cause delay, and one excuse would follow another, until by the time a contract was completed and signed it was so late in the season that the different agents working for the companies that were in the combine had covered their territory and sold to many members, and where a member was known as such they would make a special rate to him as cheap as we could sell; in that way would try and discredit the organization. Even some members of the Executive Committee were caught in this way. While I was President, I was approached by an agent and offered a car of fertilizer at a price much below the price put out by the Association for the same class of goods. Had I made the purchase they would have used it to their advantage. Finally we made a contract with a firm that was outside of the combine, which worked much more satisfactory for two years than any theretofore. The third year the State analysis showed the goods slightly deficient in some of the ingredients. The combine then secured all the station bulletins they could get, and sent a few to each agent who took particular pains to show the members of the Association wherein they had been cheated by the organization. The year that followed our sales dropped down to 150 tons and that is where we stand to-day.

In the matter of co-operative packing and sales, we have not yet been able to agree on any definite plan. One of the difficulties in forming a stock company, is for a body of men assembled together to agree on a man to manage the business, and have that man a safe, conservative man. Any large body of men cannot, as a rule, agree on a safe, conservative leader, and before I put money into a stock company, I want to know who the manager is to be. We all know in almost any organization, that to take away the right of election of officers from the whole body of the organization and place it in the hands of a nominating committee, there is often trouble, and yet the only safe way to place officers in nomination is through a committee. I have come to believe the only way to start at least in co-operative packing and marketing is through a local packing house. Take for instance, ten men who each grow, say from five to eight hundred or a thousand barrels of apples, let them form themselves into a company, rent a storage of sufficient capacity, elect their manager, pass some regulations that their apples shall be packed in two or three grades, but that No. 1 are to be of uniform size for the kind, and free from blemish, make them better than the ordinary pack. Then probably the manager cannot be at the packing house very much of his time as he has his own crop to see to, so hire some good man as a foreman, put him at the packing house with, say, five or six men to do the work. Then when picking begins in the orchard put the apples in crates. As soon as a load is picked, have a team deliver them at the packing house. The manager there can sort and pack them and store them away. This would be for all fall fruit and Greenings. Then when you get to picking Baldwins (which is the principle crop in Western New York), they can be put into barrels in the orchard and drawn to the packing house and store away just as they come from the tree, and sorted and packed during the winter. By this course the farmer is through with his work when the picking is done. The apples all being packed under the direction of one man will be of an even grade, and at less expense to the grower than if put up by five different gangs of men. The manager then has control of from three to five thousand barrels. If put up as they should be, the buyer would always look after that lot first and would be willing to pay from twenty-five to fifty cents per barrel more than for ordinary pack. When we realize that all this work must be done anyway, would not the packing house pay?

If this problem can be worked out right and carried on long enough to establish a brand that is known wherever seen the profits will be still greater. When the results of one of these local packing houses is seen by others, they, too, will organize and work it up in that way until it is general. So few of the general farming public are familiar with business matters and business men, is one of the factors to contend with, and the jealousies that exist among farmers is another serious trouble. All of which will be partially remedied when our boys are better educated.

CO-OPERATION IN FRUIT GROWING.

BY MR. M. C. BURRITT, *Ithaca, N. Y.*

In a certain well known fruit growing region where large quantities of fruit are grown, a co-operative effort to improve the quality of the fruit by spraying, and the quality of the pack by better packing resulted in a rise in price from eighty-five cents per box in 1903. to two dollars and thirty-five cents per box in 1906.

A Chicago horse dealer was complaining of the difficulty in securing two hundred draft horses in a certain section. "Suppose," said a gentleman in the hotel where they were talking, "that you knew of a locality where all the farmers bred good draft horses, so that you could secure such as you wanted in two days? How much more per horse would you think it worth to you?" "Thirty dollars," instantly replied the dealer. "Do you know of such a locality?"

In certain sheep-raising sections of Scotland, the sheep are driven to a central market, and there sold at auction. At a recent sale sheep thus sold brought from fifteen to twenty shillings a head. Their quality was up to the average and they were to be had in sufficiently large numbers. But one lot of about thirty attracted special attention. They were first-class, but not unusual except that it was difficult to distinguish one sheep from another, so uniform were they. Breeders wanted these to breed from; dealers wanted them for the trade, and such was the demand that the entire lot finally brought thirty-one shillings per head—more than one-third more than the average.

In none of these cases were the vital defects in the products themselves. Quality sold the fruit, quantity the horses and uniformity the sheep—each at a considerable advance over products similar in other respects. The question arises, how can these desirable qualities be secured most certainly? The answer is by coöperative effort.

"Farmers must learn the vital need of co-operation with one another," declared President Roosevelt in his great speech to farmers at Lansing, last June. "The people of our farming regions must be able to combine among themselves as the most efficient means of protecting their industry from the highly organized interests which now surround them on every side. A vast field is open for work by co-operative associations of farmers, in dealing with relation of the farm to transportation and to the distribution and manufacture of raw materials. It is only through such combination that American farmers can develop to the full their economic and social power."

The principle of co-operation is not new. It has been in operation since Jacob tended Laban's flock in Padan-Aram and received a share for so doing. It is a well known fact that agricultural communities existed in Europe in the Middle Ages, and that at that time there was a co-operative use of land which would be deemed almost revolutionary if proposed now. The success of the Rochdale co-operators in England, has been known for upwards of two hundred years. Co-operative creameries in Canada have raised the price of butter from ten to thirty-five cents per pound. Fruit growers' associations in the West have nearly doubled the prices of their fruit. In fact instances of this kind multiply themselves.

Naturally at this point we ask, What is co-operation? It may be defined as the concert of many for the compassing advantages impossible to be reached by the one, in order that the gain may be more fairly shared by all concerned in its attainment. "A co-operative society" declares one writer, "begins in persuasion, proceeds by consent, accomplishes its end by a common effort, incurs mutual risks, intending that all members shall receive that just award of gains proportionate to work executed, to capital subscribed, or custom given."

"We must work out a means of working together," says Prof. Bailey. "This is to be a great constructive work, lifting the individual by developing the associative spirit in such a way that he may obtain his own self-help at the same time that he secures the help of his fellows and the incentive of community action. Any group-association that crystalizes about a real economic problem, has the spur of necessity and therefore has vitality."

This is an age of organization and co-operation. All modern successful business operations are based on organization and only those lines of business which are well organized are markedly successful. Keen competition and an insatiate desire for greater profits has driven nearly all classes of industry not only to organization, but to co-operation. Our great industrial companies are nearly all co-operating in their respective lines. The so-called "trusts" are of course, the direct result of this extensive co-operation. However, in many lines of business, competition had destroyed profits and a combination was necessary to cheapen the cost of production, or increase the selling price, or both. The old adage, "Competition is the life of trade," has in many cases become, "Co-operation is the life of trade."

An individual would be strong enough if there were only a few individuals, but when an individual is one of a large class he is weak and the larger the class, the weaker the individual. Since the farming class is the most numerous, it follows that the farmer is the weakest of individuals when he stands alone. The fact bears out this theory. Practically every farmer, as Director Bailey points out, "stands alone in his farming, and attemps single-handed to contend with all the co-operative interest of the business world. The result is that for the most part he is a negligible factor in trade." For years farmers have been compelled to accept buyers' prices because they lacked the organized power to enforce more equitable prices. Nor is this all. Farmers have in many cases when there was no necessity for it so competed with one another as to destroy all profit.

It is clear that farmers have within them undoubted great power, but they can only exert it through organization and co-operation. Unorganized, farmers are weak, and are the prey of all other strong individuals and organized classes. Organized, they may exert a power second to none. Farmers represent the greatest invested capital in the world. They own the essentially productive part of the earth, controlling the world's supply of food and clothing. The power of labor and capital would sink into insignificance beside that which organized farmers could exert. Although the third to assert itself, the farmer power would be the first in strength and importance, widening a power such as the world never before knew.

But let us not misunderstand the true purpose of co-operation. It is not to tyrannize over the rights of their fellow-men, that farmers should organize. Unless he can secure his just rights without infringing on the rights of others, better that he remain as he is. Co-operation aims not to increase the selling price of farm products, but to cheapen the cost of their production, save the middlemen's profit, and secure to the consumer a better article. Co-operation should result in the betterment of all.

The History of Co-operative Fruit Growing.

If we examine the horticultural situation we shall have no difficulty in observing great opportunities for improvement. Our own observation leads us to think that the greatest need is that of the application of modern and systematic business methods to the fruit industry. In order to fully realize this need, and to impress upon ourselves the importance of the matter, let us inquire into the conditions and methods of other fruit growing sections, where modern business methods have already been applied. Perhaps the most striking of these, and those in which we are most interested are California, Hood River, Oregon, Fennville, Mich., and the Province of Ontario, Canada. Of the history of co-operation in these places we shall speak briefly, to dwell more at length on their business organization and methods.

The great difficulties which the individual fruit grower meets may be briefly summarized under four heads:

1st. The grading and packing of the fruit is not at all uniform or satisfactory in quality. As a rule, fruit is poorly packed and low in grade. It is ununiform both as to fruit and to package.

2d. Transportation of fruit and its disposal in market is also highly unsatisfactory. Most fruit is moved in less than car lots, which makes the cost high and the service poor.

3d. There is not the proper relation between producer and consumer, between supply and demand. Too much of our fruit is handled on consignment, and by too many middlemen, many of whom are dishonest.

4th. The individual fruit grower, working alone, has no power to remedy this state of affairs. He is unable to trace shortages, remedy losses in transit, or influence materially better service.

But the aim of this paper is not so much to enumerate the losses and difficulties incurred in handling fruit, with which the fruit grower is only too familiar already, as it is to suggest a remedy by which these difficulties may be partially or altogether overcome; and by familiarizing ourselves with the methods and results of the most successful co-operative associations, to show how they are now being met by the most progressive fruit growers in this country.

California has perhaps as much experience as any horticultural community. Two methods have been tried out there. The first of these may be termed a pure democracy, i. e., an organization composed of many members throughout the State, who gather in one great assembly to direct its affairs. It is only necessary to say that this failed because of the difficulty in getting the widely separated groups of members together and the consequent lack of responsibility on the part of any one, which led to an absence of confidence in the organization. This, together with various local difficulties, caused the abandonment of this attempt at co-operation.

The second method, that of a representative democracy which meets our political needs so well, was also found to meet the needs of industrial life. Such an organization, by uniting with any other permanent factor in its field of operation, has again and again proved its practical efficiency. "The Southern California Fruit Exchange," was the first to demonstrate the value of this method of co-operation among citrous fruit growers. From a small beginning they grew to a business of seven million dollars a year. Equal success has attended the same method as worked out by the California Fruit Exchange, in deciduous fruits at the north.

But probably the greatest success in co-operation in California has been made by the California Fruit Distributors, organized in 1901. This organization at present handles from 80 per cent. to 85 per cent. of the output of fresh deciduous fruits in the state. It is in reality a clearing house, being composed of shipping companies and individuals not growers, as well as of the growers themselves. The plan is that: first the formation of local associations exclusively of fruit growers, the function of these being to get fruit ready for shipment in car lots, and to unite in a central packing agency for marketing the same. In the second place a centralized growers co-operation association is formed, based upon these local organizations, which attends to shipping and marketing the fruit. The California Fruit Distributors as yet comes far short of the high efficiency desired, partially because of the unwillingness of its members to make such concessions as will enable it to efficiently organize its marketing agencies. Undoubtedly, however, it will develop along these lines as the need becomes more imperative.

In Michigan we have an especially noteworthy example of the value of co-operation. At Fennville, under the very able leadership of Chas. E. Bassett, the problem has very nearly been solved. Not only has a better market and better prices, with cheaper packages and cheaper and better transportation facilities been secured, but they have gone further and established the central packing house system. The Fennville Fruit Shippers Association was organized in 1891. Their growth and successes have been steady and consistent. A local agent loads the fruit, which goes to Chicago by a special fast freight, and another agent receives the consignment and distributes the fruit. A standard package has been adopted which saves at least half the cost of the package. The freight rate to Chicago has been reduced from 6½ to 2½ cents per basket. In one season 6,000,000 baskets were shipped, and the saving to the growers by the Association was not less than $200,000. The Association has laid by a cash profit which has been used to build and improve roads. Before it began this work 250 baskets were considered a load. Now 500 to 600 baskets are easily drawn. The combined influence of growers led the railroads to donate 300 carloads of gravel. Whereas a single individual has much trouble in getting the ear of the railroad officials, the representatives of an organization of 400 shippers, receive a most respectful and gracious hearing. Buyers have come to Fennville to buy, and competition for Association fruit has been such that prices have generally been kept higher than the Chicago markets.

Probably no co-operation organization has made such phenominal growth or achieved so great a success as has the Hood River Apple Growers Union. Previous to 1903, Hood River Spitzenbergs, of practically the same grade as now, were selling for about 85 cents per box. The first year the union operated, the same grade of fruit sold for $2.00 per box f. o. b., and last year the entire output went at $2.60 per box. The union, now having a membership of 115, controls about 85 per cent. of the output of the region.

The plan of organization is the common one and simple. Shares are sold at so much per share and each member must hold one. A charge of five cents per box pays the entire cost of handling. The union guarantees every box and allows no seconds or poor varieties to go out under the union label; the grower must dispose of these himself. The result is that such a reputation has been established that its products are sold in the exacting English markets without inspection. Many economies are made by buying supplies in large quantities, and the union can afford to use the telegraph in keeping in connection with the markets such as no individual could afford to do. Sufficient power is possessed by the union to largely protect itself from underselling and to keep prices up. The union is also able to sell its products by "tender." Each year just previous to harvesting careful estimates are made of the crop. Then sealed bids are asked for on the crop or on parts of it. Practically all Hood River fruit is now sold in this manner, which is one of their greatest achievements.

It is somewhat surprising at first thought that our horticultural neighbors across the lake, whose interests in fruit growing do not compare with ours, should so far out-do us in the handling of their fruit. In the West where orchards are new, we are not so surprised at new marketing methods, but we fail to see why Canadians who are as old in fruit growing as New Yorkers, should be ahead of us in adopting modern business methods. But such is the fact. however. The Fruit Marks' Act of 1903 and the thorough cooperative organization in the Province of Ontario are unmistakable evidences of it.

The basis of co-operation is substantially that which has proven so successful elsewhere. At present there are more than 40 local associations, each complete in itself, but all working with and aided by the Central Ontario Co-operation Association. These local associations are of two types, which, however, merge into each other. The first is the mutual association in which a number of growers simply sign an agreement to ship all their fruit together from a certain point, under the direction of a business committee, and through them a manager who superintends the packing and markets the fruit. Each agrees to bear his proper share of expenses and to dispose of his fruit in no other way. There are many variations of this agreement, and as we have already said, it merges into and is often combined with the second type—the incorporated.

In this type the association is fully organized and is incorporated under the Cold Storage Act of Canada. They are thus able to buy and sell all kinds of fruits and fruit growers' supplies. They usually own property, especially packing houses, and are in every way more permanently organized. Of this organization we shall speak more fully.

Each type has its advantages and its disadvantages. The mutual is simpler, more easily dissolved and perhaps naturally precedes the first. But it has not the scope of possibilities of the other and there is no individual responsibilty. The incorporated association has a much better organization, and a wider field of work. It is adapted to regions where large quantities of fruit are grown by many small growers, and under poor conditions for marketing. But it is harder to get started in a community and leads to problems which it requires some skill to solve. Forrest is an example of the first type, Catham of the latter.

Organization and Business Methods.

The objects of co-operation as stated in the by-laws and constitutions of associations are simply to prevent unnecessary competition in marketing among local growers and associations; to promote harmony among them; to provide for a uniform system of packing and shipping; to secure all possible advantages in the marketing of fruit; as well as to build up a high standard of excellence, and to create a demand for the same; the diffusion of knowledge in all lines of horticulture; to provide ways and means for the growers of fruit and other products to secure by co-operation among themselves and with railroads and express companies, and by all other lawful and legitimate means the cheapest and best transportation services for their fruits and other farm products and the proper distribution, marketing and sale of the same.

In some cases besides these usual objects of co-operation, provision is made for buying and selling products for profit; planting orchards, manufacturing, buying and selling all kinds of fruit-growers supplies; shipping and transporting fruits, for profit and on commission; in short to carry on a wholesale and retail shipping business as any firm or corporation would. This kind of organization, while it is still co-operative and still results in direct benefit to the grower, is not the true type of the co-operation movement, but borders more nearly on the mutual stock company. Of course the stockholders are the chief benefitors. Nevertheless, somewhat of this plan must often be followed to secure the greatest benefit to the members of the organization. To purchase and handle all growers supplies, as spraying material, barrels, etc., is certainly legitimate co-operation. Then too, it often becomes necessary in order to give men steady employment, or to make larger and hence cheaper shipments to any given point, to buy some outside fruit. Besides this little speculation often pays the expense of handling the whole shipment. Still the primary and simplest form of co-operation is among growers only and for the selling, packing and shipping of their own fruit. The foregoing simply shows the many modifications which arise and which sometimes so change the original plan that we hardly recognize it.

The general plan of organization seems to be to elect from five to fifteen trustees, who elect or appoint all officers of the association. When the association is general and composed of other associations, these trustees or directors are elected by delegates from the sub-associations. When the association is composed directly of growers they are elected directly by a majority vote. Officers, usually elected or appointed by the trustees, are as a rule simply president, vice president, secretary, treasurer and manager.

All property is held by stockholders who receive dividends on stock held, if any accrue from charges for selling and profit on handling in addition to the advantages received by every member of the association in marketing his fruit. This plan simply insures the men who put up the money for the business, an ordinary rate of interest on their money. Each member is charged a rate of so much per package, or a percentage of gross sales, and this charge is made just enough to cover expenses.

The capital stock of these associations, outside of property held by the stockholders, varies from $1,000 to $15,000, and is divided up into shares of from $2.00 to $10.00 each. Usually each member is required to hold at least one of these shares, and is prohibited from holding more than a certain number. As a rule, not more than one-half of the capital stock is paid up, the other half being held in reserve.

The central packing house system seems to have come into very general use among co-operative associations themselves, but in some cases, especially at first, the packing house is rented. When owned it is paid for by subscription among the members of stocks, and dividends are drawn upon this stock. This method of packing fruit has been demonstrated to be one of the most practicable and satisfactory of any yet tried.

Mr. C. E. Bassett, of Fennville, Mich., is the pioneer of the central packing house system and he has this to say about it. "We have five of these packing houses at Fennville, and although the system is not yet fully perfected, it has already demonstrated its efficiency in handling the products of large orchards. Usually six or eight growers combine and erect a packing house beside the railroad. Their fruit is brought direct from the orchards to this central packing house, where it is carefully graded and packed, each grower receiving credit for the number of baskets (peaches) of each grade. The foreman and packers having no interest in the fruit, pack top and bottom alike and every basket can thus be guaranteed. Solid cars of one straight grade can thus be purchased any day during the season, and we find that buyers will pay more for this fruit than where they have to drive around the country and pick up a load of as many grades as there were packers."

It does not seem practicable to pack deciduous or perishable fruit in a central packing house because of the greater number of packages required for a carload and because the fruit is injured by handling the extra time. Many of our western associations prefer to pack their fruit in the orchards of the growers, with experienced gangs of their own packers, e. g., Hood River. This is probably the best method there because of the more favorable climate, and because of the larger orchards and better packing facilities. In Western New York where weather conditions are uncertain during the packing season, and where immense quantities of fruit must be packed in a short time, and by one association, the central packing house would be a great advantage. In Ontario, Canada, where the conditions are most similar to ours the central packing house system is in almost universal use.

There are of course very many styles of packages used and their cost is consequently very valuable. Packages must naturally be adapted to the market and trade, and where these demand a fancy pack they should have it as the most profitable package which can be used. Western associations use the box very largely, most of their packed fruit being first class or fancy. There can be little doubt that the box is the package for the better grades of fruit. The barrel is still the most common package used in Canada.

One of the greatest advantages of the central packing of fruit is that it secures uniformity in the pack and a much better quality in the grade. The cost of packing varies considerably with the package used and the kind of fruit packed, as well as the grade of the fruit, but it is very generally lower in the central packing house than out of it.

Many western associations issue minute instructions, regarding the pack of each grade, carefully defining the apples to be packed in it. The packers are held to these regulations by a system of fines. In Canada the different grades are very closely defined by the Fruit Marks' Act, of which most Canadians are very proud.

When the grower delivers his fruit to the warehouse he is given a receipt for the number of packages of fruit delivered. After this fruit is repacked, he is given another receipt, showing the grades and the amount of each into which his fruit has gone. This receipt is made in duplicate, the association retaining one. The grower gets the average price received for each grade during the season. The best plan of payment seems to be that of turing over to the grower at the end of each week, three-fourths of the gross sales of his fruit during the week, and the balance after deducting expenses, at the close of the shipping season.

The charge for handling is made up on an average of the whole cost for a given number of packages. In some cases a fixed charge is made on a percentage basis of the value of the fruit handled. which amounts to the same thing. In all cases the members are given the lowest possible or cost rate, while when outsiders ship through the association they are charged at a higher rate. It is impossible to give any figures on the cost of packing which will be of any value, but growers packing in this way invariably testify that the cost is much less than by any other method.

All other expenses of the association, such as book-keeping, correspondence, equipment of the packing house, manager's salary and other incidental expenses, are met in the same manner as those of packing, viz., by a charge per package, or by a percentage of the value of the products handled. As has already been stated the packing house is owned by stockholders, and a charge has to be made in some way on fruit shipped by the association, to cover a reasonable rate of interest on this. When enough outside fruit is handled to secure a considerable profit, this profit is divided between dividends to the stockholders and lowering pro rata expenses, or a bonus on fruit shipped. This often amounts to considerable.

It is found to be quite generally the case that a good manager was very essential to success. Capable, efficient and honest men. with the ability and push to make a business go, are indeed rare, but they may be found. Such a manager practically secures the success of any undertaking. As a rule co-operative associations are largely managed by some grower much interested in the work. There is a place, however, for the trained employe, who will have no other interest save to act as business manager, overseeing the whole plant. At present the salary is small, ranging from $2.00 to $5.00 per day during the season, although in one case the manager gets 5 per cent. of gross sales and in another $800.00. But here as elsewhere the quality of the man determines largely the amount of his salary. The work is pleasant and for the man thoroughly conversant with co-operative methods a great field lies open. It will readily be seen, however, that the duties of a manager who does not only oversee the packing and shipping, but to keep an accurate account of all receipts of fruit, and in small lots, and of their sales and prices, as well as keeping in touch with the markets. are not by any means light. Several associations have, in fact, relieved the manager of overseeing the packing by appointing a head packer, and making him responsible for that part of the work.

In California the receipts of growers, members of the association, were always a little higher than that of outsiders, except where such outsiders were large growers, and for this reason had special markets and advantages. The Newcastle Fruit Growers two years ago received the highest price paid for apples in Canada, and packed the highest quality of fruit—according to the government inspectors.

As near as can be determined, the Ontario associations generally received from 75 cents to $1.50 per barrel more than individual growers for their fruit. They put up a very high quality of fruit, but they handled it at a much less cost than the average grower.

But there are important items of saving expenses, as well as of increasing the selling price and lessening the cost of handling fruit. All supplies as barrels and boxes, spraying material, etc., are quite generally purchased by the associations in sufficient quantities to make possible a considerable saving. These are of course sold to growers at cost. Usually at least three to five cents per barrel can be saved in this way, and this year the Forrest Association saved fourteen cents. Fifteen to thirty per cent. saved in spraying supplies is not at all uncommon. Money saved in the delivery of the finished product, is just as good as an additional price for the fruit, and becomes a very important item on a large amount of fruit.

Summary.

We may conclude then that the following benefits have actually been secured by co-operative associations:

1. Co-operative packing has produced a higher class of fruit in its respective grade than would be done by the average individual packing his own fruit.

2. The style and uniformity of the package and grade has been greatly improved, securing the confidence of the buyer; the buyer may also secure a larger quantity of a uniform brand.

3. Since shipping is done in larger quantities, at least in car lots, better transportation facilities and rates are obtained. Associations of growers can demand a fair deal from the railroads where individuals would be able to secure nothing.

4. Co-operation has insured a better system of marketing, with a much more complete knowledge of markets, has done this marketing with less losses, and is better able to make good its losses.

5. Co-operative packing and marketing, enables the grower not only to secure better prices for his products, but to produce a better product, because he can give his whole attention to the marketing of the fruit.

6. Co-operative associations are able to secure packages, spraying material and other supplies in large lots and at greatly reduced costs.

Finally, in brief, I think we have seen that co-operation in the marketing of fruit, secures the consumer a better product, and realizes the grower a better profit.

It is urged against co-operation that it is essentially a trust among fruit growers to force the consumer to pay a higher price for his fruit. Such is not the case. The sole objects are to grow and pack fruit, at less cost, to market it in better condition, and in larger quantities of uniform fruit. If a higher price results, it is due to a higher quality in the product.

The claim is also made that farmers will not stand together well enough to make co-operation successful. True co-operation has many times failed on this account, but true also that farmers have stood together, and what has been done can be done again.

Again it has been urged against this system by some, that it is of no benefit to the large and already successful owner, who sells in carload lots, buys his supplies in the same manner, has his own with perhaps fancy packs, and a reputation already made and a trade of his own establishment. Co-operation does not aim to help such men so much as to place the smaller grower on an equal footing with them. We must bear in mind that the great bulk of our fruit is not grown and marketed by such men as these, but by hundreds of small growers. It is these men who need to have their standards raised and their cost of production cheapened. The larger grower is not injured by having his neighbors' standards raised, but benefited.

"Association is assuredly the keynote of the future." Not the socialistic or labor union kind, but the simple combination of mutual interests for mutual benefits. True co-operation aims to bring the producer and the consumer in the closest possible relationship. Justice between man and man is the foundation of society. "Co-operation returns to the people the profits they create and makes them owners of the business they build."

All this may seem Utopian to some. It may be that the time is not yet ripe for co-operative organizations in this State, but there can be no doubt that it will come—must come—sooner or later, if the fruit grower is to keep apace with progress in other lines. The sooner we realize this, and bend our energies to our common interests in the matter, the sooner will fruit growing be placed upon its proper firm business basis, and its present discomforts avoided.

SOME PHASES OF PENNSYLVANIA FRUIT GROWING.

BY PROF. JNO. P. STEWART, *State College, Pa.*

There are two main divisions to fruit growing, the business phase and production. Nobody will undertake the latter without some assurances concerning the value of the former. Hence we first consider it.

The August number of the Western Fruit Grower states that "the 1907 crop will bring about $2,000,000 to the apple growers of Washington county, Ark." Fifteen or twenty years ago, under a system of general farming in that county, the average yield of corn was 15 bushels per acre, and the average price of land was $15. Realizing the barrenness of this style of farming, people began to plant trees. Part of the result is indicated above. The price of land in that county now, set in orchard, is $100 per acre up. Orcharding increased the value of the land nearly seven-fold, besides paying an excellent profit to the holder.

Twelve years ago in Perry county, Pa., the President of our State Horticultural Association bought an abandoned farm of 100 acres for $875. This fall from four acres of 11 year old Baldwin trees he sold $620 worth of apples. Note that one acre, costing $8.75, 12 years ago, brings $155 this year, a return of seventeen-fold on its cost, and he still has the acre. The farm is paying strong interest to-day on $10,000, and its producing power is only beginning.

Eight years ago in Franklin county, on the east side of the Cumberland Valley, a grower bought a farm for $50 per acre. He planted it in apples with peaches as a filler. In the last four years, from about 100 acres of bearing trees, he has sold $98,478 worth of peaches —a return of nearly $1,000 per acre in seven years from planting, with an apple orchard coming on on the same ground. One block of 16½ acres of Salway peaches in this orchard has returned $30,111 since planting in 1900. Yet land like this in the same neighborhood, now in general farming, can be bought for $40 to $60 per acre.

Nine years ago near Youngstown, N. Y., an unproductive 20-acre orchard of Baldwin changed hands. Proper orchard management was installed and the net returns from that orchard in the nine years has been $27,602. This, in spite of the entrance of the San José Scale with its additional requirement of power sprayers and extra spraying.

These instances are not accidents. They represent returns from large acreage extending over a term of years, and are not the chance returns of a few trees for a short period. They call attention to the business value of good fruit growing. They show that it is easy to waste energy and capital trying to make a region produce something for which it is not adapted, and that it pays to seek out and do the adapted things. They illustrate clearly the profits that may arise from basing an industry on one of the most striking natural adaptations of this state—the adaptation to tree growth. They show that many farms in our state, useless or of indifferent success in general farming, can be made remarkably profitable in the production of fruit.

But these are not the only indications of the fact that fruit-growing in Pennsylvania is a good business proposition. In 1899, the last year upon which we have definite figures, Pennsylvania was the third state in the Union in the total value of fruit. In apples, the leading fruit of America, Pennsylvania ranked second, with over 24,000 bushels, nearly all of which came from home orchards. And although the state was excelled by New York in total yield, yet in average yield of apples, Pennsylvania excelled the latter by nearly one-half bushel per tree. Pennsylvania has been called the "home of the sweet cherry," so as we should expect, in the production of cherries, this state ranked first with nearly 475,000 bushels. In grapes, pears and raspberries it was fourth; in currants, seventh; in blackberries, eleventh; in plums and prunes, and in strawberries, thirteenth; and in peach, sixteenth. These positions are all the more striking when it is realized that by far the major portion of this fruit was grown in home orchards receiving only "home orchard care," with the consequent reduction in value which, we know too well, accompanies such care. If these results can be obtained under such conditions, what may be expected from properly located commerial orchards handled in a business-like way?

But some one inquires, "is not the occupation too exacting, does it make good return per unit of labor, and are not the returns slow in coming in?" We answer that it is exacting; that in good fruit growing certain things must be done, and done at the right times; that the only safe motto is the one followed by the pests and bugs, which is "be ready," and that it requires wider information, a greater keenness of observation, and more ability to adapt action to immediate conditions than almost any other calling. Hence the occupation should not be chosen by any one "who is afraid he won't like it." But for the man possessing the above qualities, who is not afraid of a contest, and is not easily shaken from his purposes, it is an occupation that has few rivals either in financial returns, or what is of greater importance—in promoting the development of the individual. There are no keener nor better men than some I have met among Pennsylvania fruit growers. There are few better solutions to the problem of keeping the boys on the farm than to get them interested in the production of fruit. To know a fruit farm, in all its details of soils, and varieties and inhabitants and to be able to manipulate them is a liberal education.

As to the returns-per-unit-of-labor, we may say that in Erie county, the grape business regularly returns from $50 to $150 per acre with an outlay that we are informed is scarcely greater than that involved in raising an acre of corn. In the same county last year goose berries are reliably reported to have produced no less than $900 per acre. Near North East $1\frac{1}{8}$ acres of 12-year-old, so called "York State" prunes—probably a strain of the Italian or Fellenberg,—the last two years produced the unusual sum of $1,688, with almost equal returns reported from Bradshaw plums. In Berks county during the same time, 5 acres of peaches produced $1,100 per acre. These are only a few of the results that we have gathered in a very general fruit-survey of the State. They indicate the wide range of territory and varieties that are profitable here. While we have no data to show just what the outlay was in producing them, yet they should effectually set at rest any fears as to the size of "return per unit of labor." There is no question about it. with the man and the other factors right, fruit-growing offers as liberal returns, in proportion to labor and capital involved as any occupation upon which we have seen figures. Just there is our problem, to get the factors right and keep them right.

The third question, as to the returns being slow, will be discussed later. We may say here, in passing, that this difficulty can be much lightened by a proper system of intercropping and by the use of fillers adapted to the section. This is a difficulty that must be reckoned with, however, by men of small means, to avoid the danger of over-reaching with the consequent danger of neglecting or sacrificing his orchard. But it is clear that for such returns as those recorded above it will pay to wait.

Most of what has gone before is on the business phase of fruit-growing. There are a few things more to be noted in this connection, before taking up the producing side.

First, this State is just starting into commercial orcharding. In the decade covered by the last census, Pennsylvania planted 2,676,000 trees as compared with 626,000 planted by New York. This planting is still actively going on in certain parts of the State. These orchards are coming into bearing, and there are many problems that the owners are facing. Chief among these, in connection with the apple, is storage. Apples have two important advantages over most other fruits. If the market is unfavorable at picking time, they can be readily held until it improves. And the fruit has so many uses, and can be shipped so widely, that the market seems able to handle an almost unlimited supply during the entire year, hence, prices are practically sure to rise during the storage season. This is especially true in large crop years when prices are low at picking time. We can illustrate this by the experience of two men in southern Pennsylvania last year. One of them had 900 barrels of Gano, which he admits were as fine looking as any apples he ever saw. For these he obtained 90 cents per barrel in the orchard. which was considered a good price at that time. Yet from April on. those same apples were sold regularly on the Philadelphia market for $4 to $6 per barrel. Another grower in Bedford county, with the lamented Ben Davis stored his apples in a 300-dollar "cold-air" storage house holding about 600 barrels, and in March sold them for $2.25 per barrel for the fruit, for which he was offered only 50 cents in the fall.

The first grower does not feel that he is against the storage question yet, and we admit that he is not facing it by any means so strongly as he will be in the near future. But he was against it last fall. The Illinois Station has shown that a very satisfactory ice storage house of 2,000 barrels capacity can be built for about $3,500 ($3,430.40). This building, in Southern Illinois, is reported to have kept apples during the seven months' storage season at a temperature of 33 degrees or slightly lower, at a cost of 19.1 cents per barrel, including 10 cents interest charges per barrel. This represents an annual saving of $618 on 2,000 barrels over ordinary city storage charges. It also often saves unnecessary freight and cartage charges. And this house could have been put up last year by the grower with 900 barrels of Gano had he sold them at this spring's prices instead of last fall's. This is not presented in any sense as a criticism of the grower, but to illustrate the fact that in this comparatively new business, growers are often confronting problems of which they are not aware, and to show that it is poor economy to delay adding an equipment that is really needed.

Then there is the question of marketing. We often receive complaints "that fruit wastes when there is a crop," "no buyers, and prices so low that it won't pay to handle it." If the fruit has been properly grown and is really good, there is absolutely no excuse for such results, especially in such a year and state as this. To sell apples regularly and profitably, three things are required. First, the fruit should be really good, of proper size and color, and free from blemishes by codling moth, scale or fungi. These can be prevented by efficient spraying, and by that only, as I have reason to know. I have seen an orchard this fall so free from codling moth that, in spite of a heavy crop of fruit, I was unable, after considerable search on trees and among wind-falls, to find a single apple that had been injured by that insect. We did find some injury by the lesser apple worm (Enarmonia prunivora), but no codling moth. Of course there was codling injury there, but it was so scarce that one had to hunt for it and hunt long. These apples would sell on any market. Proper spraying is good business policy.

The second requisite for profitable selling is that the fruit be properly packed. I have seen carloads of apples this fall, selling at 40 cents per hundred, loose and mixed, when similar fruit in other localities properly barreled, sorted and graded was bringing $3.00 per barrel. After allowing for the extra cost, this was an increase of over 400 per cent. for the trouble of packing the fruit right. That is an extreme case, but it shows how little attention is being paid to some of the simplest business principles, and indicates why some people fail in fruit growing.

The third requisite is to let the location of good fruit be known; in other words, when necessary, advertise. Ink is cheap, and its use is understood in most other vocations better than in the fruit business. This advertising need not be done in the papers. An efficient method of disposing of fruit of all kinds, in moderate quantities, which are in excess of the demands of local markets, is in operation by a grower in Erie county. He gets Dunn's or Bradstreet's Business Guide and makes a list of all reliable fruit dealers or grocers within convenient express distance from his station. He then takes his hand press and sets up a form in type telling just what fruit he will have for sale during the next two or three days, and sets a price. This is run off on special souvenir post cards with colored pictures of the general kinds of fruit offered—cards being obtained from the Stecher Lithographic Co., Rochester. The result is that his fruit all moves off promptly direct to the retailers and all at remunerative prices, inasmuch as he sets them himself. In this way his apples were sold this fall at $4 per barrel, when ruling prices from buyers were only $3. This system has the advantage of directness. The fruit goes straight from grower to retailer, and in the absence of fruit marketing associations, is one of the most efficient methods of marketing yet seen.

Turning now to the *producing side of fruit growing*, the first problem the prospective orchardist strikes is the soil. What kind of soil should he choose for apples, and will the same soil do for all kinds? This is a most important problem, and one that we wish we knew more about. It is being especially studied now by Wilder, of the Federal Bureau of Soils. The soil expert can often tell in advance whether a soil will produce apples or not. But from the grower's standpoint, local experience with soils is of great importance in solving the problem. Oak and chestnut soil is generally considered good, but in general it appears that for many varieties a moderately heavy soil, that is one with a silty-loam surface, underlaid with a deep and somewhat heavier sub-soil is best. This subsoil may be a plastic, clay loam; not of the stiff, hard type, but plastic, friable and moist, though well drained. Upon such a soil as this the York Imperial, Rhode Island Greening and Grimes do their best, so far as our present knowledge indicates. Some varieties, however, require a much lighter and sandier type of soil. This is true of Jonathan, Baldwin and probably to a less extent of the King. These varieties will do well on the heavier soils, and the heavier soil varieties will be less successful on the lighter. Much of our condemnation of certain varieties as being too far south or of insufficient elevation has probably been due in considerable part to their location on wrong soil types.

A striking case of different soil requirements is observable in Franklin county on distinctly sandy loam, in the case of the Jonathan and York Imperial. The Jonathan is ordinarily regarded as a weak grower, "only attaining vigor with age," but on the sandy loam soils of Franklin county, thus far, it is distinctly excelling the York Imperial, both in growth and yield. The trees are growing side by side, are eight years old, and the Jonathan has borne three light crops to one crop about half as large from the Yorks. Eighty of the Jonathan trees this year bore 893½ pounds of fruit. While eighty Yorks bore 494 pounds. The average trunk girth of the eighty Jonathans this summer was 12.27 inches, while that of the Yorks was 11.24 inches. Thus in eight years on a distinctly sandy soil, the Jonathan has exceeded the York Imperial in growth by more than one inch per tree in trunk girth, besides bearing several times as much fruit.

In Bedford county on a heavier, more clayey soil, the difference is practically as striking in favor of the York Imperial. The trees are still young in both cases, so that we are unable to give final conclusions, but the figures indicate clearly that the York Imperial thrives best on one type of soil, while the Jonathan requires another.

People in planting orchards should note the different soil requirements of their varieties, so far as known and distribute them accordingly. It is only in that way that maximum returns can be economically produced. Much can be done, however, even on imperfectly adapted soils by good orchard management.

The next thing of importance to the prospective orchardist in Pennsylvania is the *management of the hillside orchard.* There are some advantages in the hillside orchard. It is not usually so costly. "Foot-hill" land is very abundant in the state. It often produces good apples, and is with difficulty rendered profitable in other lines. Drainage of frosty air and excess water is accomplished naturally and thoroughly. But it is open to the great disadvantage of the washing away of soil under tillage, and soil is usually not to be spared on the average Pennsylvania hillside.

In orchards already set, it is probable that the sod-mulch system, so successful in Ohio, is the best solution. This system has much to commend it for any orchard, if carried out in its completeness. It effectually prevents washing; the decay of the mulch furnishes a large source of food for tree-growth and bacterial action; feeding roots are permitted to develop unmolested in the surface soil, and even to come up into the mulch in great abundance, which they do the first season where the mulch is deep and undisturbed. A three-ton per acre, straw mulch, applied June 19th to trees in Mr. Ledy's orchard in Franklin county, showed many rootlets in the mulch by the first of October.

But the mulch system is open to the objection that for large orchards sufficient straw for mulching is very difficult, if not impossible to get, and, when it can be obtained, is quite costly. This will keep it out of the majority of our level orchards. But for the hillside orchardist with his trees already set, it is probably the very best system of management. It has proved so in Ohio, where it gave better results in both growth and yield than any other system, on ground that was gently sloping.

But if the hillside orchard is not already set, there is another method available which we believe affords the best solution to the problem of its management. This method is to set out the rows on contour lines—lines of equal height or practically so—and then cultivate them the level way, using a cover crop from fall through early spring and leaving a strip of sod along the rows to prevent the formation of gullies. In addition, in those cases where conditions warrant it, the soil can be plowed with a reversible plow, always in one way, and thus build up a set of terraces. But wherever terracing is intended, it should be done before the trees are set, or while they are in the early stages of growth. The contour system thus permits regular orchard cultivation and cover crops to furnish green manure and humus on hillside orchards of any reasonable slope, the same as on our best level orchards. The importance of this may be seen when it is remembered that in Warren's Survey of Orleans County, N. Y., the total number of tilled orchards during five years averaged 86 per cent. greater yield than those in grass. Essentially this "contour tillage" system is now in successful operation in Mr. Waite's orchard in Maryland. There is no apparent reason why it should not be of distinct value in extending the range of tillage and cover crops, to the hillside soils with their own peculiar advantages. The combination should work beautifully. We wonder whether there is any good reason for the present custom of setting orchard trees in squares, triangles or hexagons, except possibly for looks, and we question whether in the management of the hillside soils, a well kept contoured orchard is not to be preferred even for that.

The next matter of importance to the man developing an orchard is *how to make it pay its way, up to the bearing years.* This depends largely on the locality. Where soil and climate permit, probably the surest method is by planting peach, or possibly plum and prune fillers. There are some objections, however, to having stone fruits and apples mixed, one of which is the development of curculio. Apple fillers with varieties of early bearing habit, such as the Wagener, or fillers of dwarf apples on French Paradise stock have also been suggested to meet this need. But their value in this direction is not entirely demonstrated.

Probably the best general methods of making a young orchard pay its way are to be looked for in proper systems of intercropping. Where potatoes are successful a very efficient system can be based on them. Where the acreage is large or labor scarce a system in use in Adams county in Mr. Tyson's orchard is very good. It consists in cultivating the tree rows in gradually widening belts, and between these belts, potatoes followed by clover and timothy are grown with the addition of heavy fertilizing. One year of potatoes followed by two years of hay rotated over three orchards is the plan. It has carried the orchards up to eight years of age and returned a fair annual profit.

There may be some questions as to one phase of this system, viz., the use of hay in the orchard. Timothy especially has been credited with exerting a harmful influence on tree-growth. Its place in the system may be justified, however, because of the large acreage. And the harmful effects may be largely neutralized by the cultivated strip about the trees, the liberal use of fertilizers and the fact that the hay and sod diminish blight and check washing.

For smaller acreages we would modify the above plan as follows: Plant early varieties of potatoes and follow them with a cover crop of crimson clover or rye. In spring, as soon as necessary to plow for potatoes, turn under the cover crop, add necessary potato fertilizer and plant another crop of potatoes. Keep up method every year, unless trees get such a vigorous growth that fire blight strikes in, in which event it may be necessary to check growth by cropping in hay or grass.

Near good truck markets a vegetable intercropping system is best. One in use in Waite's orchard in Maryland, is based on sweet potatoes, cantaloupes and tomatoes. Briefly, it is as follows: First year, orchard is set in corn, latter being kept far enough away from trees to prevent injurious shading. Second year, it is heavily manured with 1,200 pounds commercial fertilizer, plus 10 tons of stable manure per acre and set to Big Stem Jersey sweet potatoes. Third year, orchard is intercropped with cantaloupes or tomatoes, or both, followed with crimson clover. It is worthy of note that the clover will not grow on his soil until after it has been trucked. Fourth year, crimson clover is turned down when about six inches high, followed by sweet potatoes with fertilization, or corn is again planted and followed with crimson clover or cow-peas, after which the series is repeated. This method of intercropping is adapted to smaller acreages than the one above, and is suitable for localities where trucking is profitable.

But the most efficient trucking system of intercropping that has come to our attention is one used to some extent in New Jersey. It consists in planting early garden peas in rows five feet apart, and using later vegetables, such as tomatoes, musk-melons, early and late cabbage and occasionally sweet corn and sweet potatoes between these rows. The crop of peas is harvested and the vines turned under in the cultivation of the other vegetables, to assist in feeding them. If the vegetables can be harvested in time, they are turned under and followed by crimson clover. If not, they are followed by rye. The cover crop is turned under in the spring in time to plant the peas. Before the peas, commercial fertilizer to the extent of 100 pounds of muriate of potash, 500 pounds acid phosphate and 200 pounds of tankage or its equivalent in nitrate of soda is applied and the same procedure is repeated, year after year. This method has been very successful in the trucking districts, enabling orchardists to buy farms, set them in trees and pay rapidly on them from the very start. They frequently obtain $50 per acre on an average from the peas alone, and where the necessary labor is obtainable near good truck markets, the system should prove very valuable here in Pennsylvania.

There are many other systems, but the main principle in intercropping is to use an early season hoed crop that will more than pay for its own and the orchard's tillage without injuring the latter. This rules out the grasses and the cereals, except possibly corn, and everything else that cannot be tilled to some extent in the spring.

We also have some evidence that there are mutual likes and dislikes in the growth together of certain plants. Some plants seem not to be friends, neither when grown together nor when one immediately follows the other. This needs to be further studied, both with reference to cover crops and intercrops, and we have plans under way to accomplish something along this line. There is no more interesting or fertile field for investigations in horticulture than these relations between trees and crops, and the general question of how best to make the young orchard pay without reducing its final value.

There are several other problems in orcharding that we must pass over at this time. Among these are management of bearing orchards, fertilization, pruning, and the selection of varieties.

In conclusion, we wish to consider a phase of orcharding that is of the most immediate importance to a great many people in Pennsylvania, viz., the handling of the old or middle-aged unprofitable, home orchard. Of course, it is impossible to say just how this should be done in any particular case without studying the causes that have made the orchard unprofitable. In many cases nothing can be done except plant a new orchard, taking advantage of experience gained and that of others in the locality. But there are also many cases where orchards are only thought to have passed beyond their period of usefulness and where a system of orchard renewal can be practiced with great profit. Many things said above bear on this question of making any orchard profitable, but some more specific treatment is demanded by the refractory cases.

We may illustrate this by an example. Five years ago in southern Pennsylvania a five-acre orchard of 37 year old York Imperials was considered so unprofitable that three and one-half acres were pulled out to use the ground for something better. It was concluded, however, that the last acre and a half should be left, and heroic measures taken to see whether it could be killed or cured. On the acre and a half, however, there were trees missing, so that actually but one and one-eighth acres of ground were covered by the 54 trees of bearing age. The owner's own description of methods and results are as follows:

"Our old orchard of 54 York Imperials about 37 years old was severely pruned the fall and winter of 1903. During the winter the ground was heavily manured and the following spring was plowed as shallow as possible, followed by an application of 10 to 15 pounds of potash fertilizer analyzing about 10 per cent. actual, and the same of potash K_2O sowed by hand in a circular band extending from a circle say three feet from tree to another circle well outside the line of drip from branches. This was followed by thorough stirring with spring tooth harrow which was repeated at intervals until about harvest time and then allowed to grow up, which it proceeded to do very rapidly. So much so in fact, that we found it best to mow twice before picking time. This operation has been repeated every year since, the off year as well as the full year (including spraying for scale and codling moth). Our account with the orchard since 1903 is as follows:

1903, before dehorning trees, gross returns for fruit, no expense except pick and pack ($35),	$240 00
1904, total expense $69.60, gross returns,	61 40
1905, total expense, $194.56, gross returns,	699 51
1906, total expense, $73.08, gross returns,	115 00
1907, total expense, $188.70, gross returns,	884 00

The first grade fruit for the several years was as follows:

1903, 87 barrels; 1905, 258 barrels; 1907, 289 barrels.

Also for purpose of comparison the net returns seem to be:

1903, $205.00; 1904, minus $8.20; 1905, $504.95; 1906, $41.92; 1907, $695.30.

Starting from the first full crop since trees recovered from heavy pruning, we find that total net returns are $1,242.17, or an annual average of $414.06. Counting the full crops only we have an average for the two years of $594.62 per year. Understand these are all net returns and are not guesses either, as we charged all labor at full price we paid for it, including 30 cents per hour for supervision."

These are actual results and methods on one specific and thorough case of orchard renewal. We have seen them proportionately successful elsewhere. Additional measures, including top-working, must be taken where the varieties are unsatisfactory in addition to being unproductive. It is desirable to start the renewal operations at the close of the full year in order that trees may accommodate themselves to the new order of things in the off year and be ready for increased bearing in the next full year.

A specific plan for doing this work of renewal on two Pennsylvania orchards has been prepared but includes too much detail for rehearsal here.

ABSTRACT OF THE PROCEEDINGS OF THE STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA, HELD AT LANCASTER, PA., JANUARY 14-15, 1908.

OFFICERS FOR 1908.

PRESIDENT.

Gabriel Hiester,	Harrisburg.

VICE PRESIDENTS.

Hon. W. T. Creasy,	Catawissa.
F. H. Fassett,	Meshoppen.
R. M. Elden,	Aspers.

RECORDING SECRETARY.

Enos B. Engle,	Waynesboro.

CORRESPONDING SECRETARY.

Wm. P. Brinton,	Christiana.

TREASURER.

Edwin W. Thomas,	King of Prussia.

REPORT OF GENERAL FRUIT COMMITTEE.

The Chairman wishes to thank each member, who, by willing and hearty co-operation, has made this report possible.

For the information of those who are not familiar with the work of the General Fruit Committee, a few words of explanation may not be amiss. Toward the end of the year 1907 a printed form, containing fifty-five questions, divided under fourteen heads, was mailed to each of 200 names, representing every county in the State. With each went also a circular letter of explanation and a stamped return envelope. Out of the 200, nearly 100 persons responded, thereby becoming members of the General Fruit Committee for 1907.

Many of the reports were prepared with great care and all of them were full of information. From these answers the general report has been compiled. The statements following are not, therefore, based on the personal view or opinion of the Chairman but are, so far as possible, his interpretation on the views of many correspondents.

For convenience, we have divided the State into four sections. Northern Border, Southern Border, Eastern and Western, placing the central counties in the group with which their reported conditions seemed to be most closely allied.

Pennsylvania is one of the great apple States; the last census placed her third in total value of all fruits and second only to New York in bushels of apples produced. While no figures are yet available, there is little doubt that the season just passed has placed Pennsylvania at the head, not only in bushels of apples, but in money received for the crop.

In every county where soil conditions are at all suitable, apples are proving a profitable crop. Out of about ninety replies, only seven report the crop unprofitable. A few report "profitable this year" and in most cases follow by saying "Conditions are better because of more spraying and better care." All of which seems to warrant the belief that Pennsylvania, in its soil, climate and people is well suited for apple growing and that at least some of these conditions are improving each year.

The season of 1907 has been a great one for apple growers. Of all reports, only nineteen tell of a poor crop. Twenty-three report a fair crop, thirty a large crop, while seven report for their districts in such terms as "enormous," "largest in years" and "extraordinary." Ninety per cent. of the causes for poor yield or only fair crops were late, killing frosts and unfavorable weather at blooming time. This condition existed pretty generally in the Western Section, and to some extent in the western end of the Northern Section, and in a few of the central counties. With but few exceptions the balance of the State, embracing the principal apple counties, had a fine crop. The figures for Adams county alone for 1907, are, for all grades, equal to $319,617 bushels of apples and returned to the growers over $174,000.00. In general, the quality of the fruit was good. The yield and quality being closely parallel, such expressions as "excellent," "unusually good," etc., being very frequent. Unfavorable conditions reported were frost and unseasonable weather and neglect of orchards. Causes of success are favorable season, increased spraying and good care of orchards.

The vote on five most profitable winter apples seem to show as follows: Northern Section, in the order named: Baldwin, Spy, Greening, King, Ben Davis; Southern Section, York Imperial, Baldwin, Grimes' Golden, Ben Davis and Smith Cider; Eastern Section, Smith Cider, Baldwin, York Imperial, Ben Davis, Fallawater; Western Section, Ben Davis, Rome Beauty, Baldwin, Spy, Russett. Other varieties frequently mentioned in the reports are Smokehouse, Staymans' Winesap and Rambo. Several reports indicate that with the increased spraying the Baldwin is becoming more profitable in the southern counties, and recent investigations of conditions in the Philadelphia apple market show Pennsylvania Baldwins selling at a premium of two to three dollars per barrel over New York Baldwins. We also wish to recommend growers to look into the possibilities of the Rome Beauty, which, by reason of its size and handsome appearance, coupled with fair quality, seems to be in high favor now. One of our correspondents recommends the Senator apple very highly as a filler, saying that it is a handsome as Wealthy, bears better and has better flavor.

Only twenty-two correspondents report any commercial planting of summer and fall varieties. Many express an opinion that such planting would be profitable and the Chairman recommends that growers give more attention to this field of apple culture.

In answer to the question: "Do growers pack their own apples and does it work satisfactorily?" only about one-third of the answers were affirmative, but in nearly every case the report showed satisfactory results where this plan had been tried and there is little doubt that growers can sell to better advantage when equipped for doing their own packing.

"Would you favor a law to enforce uniform grading and packing?" brought out forty-nine affirmative and eighteen negative answers, many being strongly in favor of such legislation and a few expressing doubt as to the possibility of successful regulation.

Pears.

The pear crop the past season has been a light one in nearly all parts of the State. In most cases the quality was good, a very few reports showing poor quality.

The outlook for future pear crops in Pennsylvania, however, does not seem very bright. Only eight counties report any commercial planting of pears and many of the old trees are going out rapidly.

Blight is by far the most serious enemy to successful pear growing and is reported to be doing much damage. San José Scale, when not controlled, is causing much loss to pear growers.

Favorite varieties are Bartlett, Keiffer and Seckel, in the order named, with Clapp's Favorite, Sheldon and Lawrence mentioned three or more times.

Peaches.

The peach crop in Pennsylvania was almost a failure, only four reported a good crop, nine fair and fifty-four reported very poor. With a very few exceptions, correspondents reported conditions exceedingly unfavorable for this fruit. Late spring frosts and rain at time of blooming were reported for nearly all sections. The vote is almost evenly divided between yellows, borers, and scale as the most destructive enemies of the peach grower. Regarding Brown Rot, eight report that it is being controlled, thirty report that it is not controlled, while seven say they have no trouble with Brown Rot. There is decided lack of unity in answering the question "Is peach culture profitable in your county?" thirty-six answering "Yes" and thirty give a negative answer. It is hard to divide the State with reference to these two conditions, but in general the southern counties, some of the central ones, and a few of the eastern ones report fair profits while north and west, with the possible exception of Erie and Crawford counties, peaches do not seem to do well.

Plums.

The crop was light, only nine persons giving a favorable reply and in most cases the frost and rainy weather were the causes assigned for this failure.

Curculio, Black Knot, Scale and Brown Rot are the most serious enemies to plum culture in the State. A few reports show loss from yellows.

German Prune is given first place as a profitable variety, followed in order by Burbank, Damson, Abundance, Lombard, Green Gage, Wickson, Red June and a long list mentioned only once or twice.

Eight persons recommend the one-half bushel basket for marketing plums, five prefer quart boxes and four use a five-pound basket.

Cherries.

Most correspondents report the successful growing of cherries and thirty out of forty-five answers indicate that the crop is profitable.

Distance from market, rot and birds are the chief adverse conditions reported. Sour cherries are most favored as desirable shippers. Montmorency and Early Richmond receiving nearly all the votes.

Grapes.

Grapes grow successfully in most sections of the State and are so easily grown and with a little care, are so generally satisfactory that no country home should be without several vines. Rot and rose bugs, both easily controlled by spraying, are the chief difficulties reported. Commercial grape growing has been very profitable in some of the northern counties, particularly Erie, and in a few other sections favorably situated as to soil and market. It is by no means general, however. Concord takes the lead as a variety recommended for home use, with fifty-one votes, followed closely by Niagara, Worden and Moore's Early. Brighton, another excellent variety, is named eight times, Delaware and Salem five times, and Campbell's Early four times, with fifteen varieties mentioned once or twice.

Small Fruits.

Comparatively few correspondents had experience sufficient to warrant their reporting on most profitable varieties of strawberries. A large part of the State, north and west, reports "No strawberries grown." The vote on varieties follows: Bubach, 12; Haverland, 11; Glen Mary, 10; Sharpless, Senator Dunlap, and Sample, 7; Brandywine and Wm. Belt, 5; Gandy and Cumberland, 4 each.

In raspberries, Cuthbert takes the lead, followed by Gregg, Cumberland and Kansas. Two correspondents recommed Black Diamond raspberry very highly.

"Name some of the hardiest and best blackberries." The answers to this question brought out the interesting fact that in more than half the State wild blackberries grow so plentifully that but few tame ones are cultivated.

Snyder is named 17 times, Eldorado 9 times, Erie 7 times, Taylor and Kittatinny 5 times.

Sixteen correspondents report profitable growing of currants and 10 report gooseberries favorably.

Vegetables.

Sixty per cent. of the reports show that the past season has been favorable for the growing of vegetable, a few reporting unfavorable weather conditions.

Regarding the most destructive enemies, correspondents are practically united on Blight of potatoes, tomatoes, etc., as the most serious. Other troubles mentioned several times are Cabbage Worm, Cabbage Root Maggot, Cut Worm, Wire Worm, Potato Beetle, Anthracnose and Mildew.

Cabbage and potatoes are given equal credit as being the best paying crops. Tomatoes, sweet corn and beets are reported frequently, and celery, onions, peas and asparagus are mentioned three or more times.

Only six correspondents report market gardening unprofitable in their counties.

Spraying.

Taking the State as a whole, the reports show that spraying for insects and fungi is increasing, although many correspondents report no increase for their sections. Compared with past years, we feel that conditions in this respect are gratifying. Not so, the answers to the question, "Is spraying thoroughly done?" forty-eight say "No" and only thirteen "Yes." This seems to us a most unfortunate condition. Nearly every report, referring to one crop or another, expresses a need for more thorough spraying, and the answers to the question "What are the results of spraying?" are almost with one voice, "Good when thoroughly done." We feel that this point cannot be too strongly impressed on the minds of all persons who attempt to spray at all. It seems very clear to us that it matters much less which of the many excellent formulae and preparations recommended to-day you decide to use, than that you practice the greatest care and thoroughness in the application of your choice.

San José Scale.

This insect is now found in nearly every fruit-growing section of the State. Abnormal weather conditions during the principal breeding season of the past year have tended to check its spread to some extent. This fact must not, however, be taken as an excuse for failing to spray during the present winter or coming spring, for plenty of live scales are present to guarantee a very healthy increase if unmolested.

Twenty-seven correspondents report that San José Scale is being held in check. Twenty-three say it is not, in most cases, because of neglect and failure to spray and where sprayed, but poorly done.

The question "What is the most effective spraying material you have used?" brought many interesting answers, some of them of considerable length. The space of this paper will not allow us to give more than a synopsis of the results, as follows: Lime and sulphur wash (sometimes with salt), 31 reports; soluble oils (two commercial preparations being mentioned), 23 reports; kerosene emulsion, 3; crude petroleum, 2; whale oil soap and Tap-a-nap Soap, 1. Nearly all correspondents who have had experience with commercial spray preparations report success and satisfaction with their use.

Fertilizers.

"Are commercial fertilizers used largely by your fruit growers?" "Yes," from twenty-six correspondents, and "No" from forty-three. The affirmative answers coming mostly from the fruit-growing counties and the negative answers, with a few exceptions, from sections where fruit growing is incidental.

Nearly all correspondents agree that stable manure can be used profitably on orchard soil. A considerable number, however, qualify this statement by saying "but not for peaches," which we believe is a pretty general experience. A few object to stable manure as not being sufficiently uniform or properly balanced.

Twenty-three reports favor the use of lime in the orchard, while seven discourage its use. It is favored because it sweetens the soil (renders it alkaline), loosens the soil when "tight" or heavy and serves as a solvent for fertilizer elements already present in the soil.

Tillage.

The queries on this subject brought so many and such widely varying answers that the Chairman of this Committee finds it almost impossible to fix on one or even on two or three methods that are at all generally practiced.

Most persons agree that peaches should have clean culture. Aside from this, the practice of orchard cultivation seems to be limited almost entirely to commercial plantations, except such cultivation as trees may receive from the working of hoed crops planted in the orchard. Regular crop rotation with two or three successive years of grain and sod seems to be a common practice in most sections.

"Hog culture—no rings" is recommended and for a bearing orchard of limited area, doubtless works very well. The Chairman finds that his own experience follows closely that of several correspondents, and takes the liberty of making the following recommendations for tillage of apple orchards: From time of planting up to time when trees occupy most of the ground, cultivate thoroughly each season, intercropping if desired with some cultivated crop or if a grain or grass crop is used, leaving a generous strip on each side of tree to be cultivated. When potatoes can be grown they afford an excellent crop for orchard planting. When trees have come to bearing age so that summer spraying is needed, it will probably seem best to discontinue the intercropping. Begin cultivation early in the spring, plowing shallow or cutting up with disc and following with spring-tooth harrow. Continue until mid-summer, then sow a cover or allow a volunteer growth of grass and weeds to grow, mowing once or twice during summer. When nitrogen seems to be needed, common red or crimson clover are excellent cover crops. When wood growth seems to indicate sufficient nitrogen, rye answers the purpose and is easily grown.

Twelve correspondents report good results from mulching apple trees, especially on hillsides and recommend using grass, weeds or any other material available for the mulch.

Orchard Enemies.

As means for destroying the English Sparrow, shooting and feeding with poisoned grain are suggested. One correspondent recommends offering a price for them.

A good deal of damage by mice and rabbits is reported. This can be avoided to a considerable extent by keeping grass and rubbish away from trees and hilling up the ground slightly before winter sets in. Several correspondents recommend protecting with coverings of veneer, wire netting or building paper. Twigs or clippings left on the ground under trees will often divert mice from attacking the tree. Most persons advise the use of knife and wire for extracting borers. A few suggest as partial preventives lime around tree. whale-oil soap and carbolic acid, boiling water, and wood ashes.

PRESIDENT'S ANNUAL ADDRESS.

In looking back over the year that his passed since our Harrisburg meeting, I see many things that encourage me as a fruit grower, and as a member of this Society.

We have had a very profitable season, our orchards and vineyards have produced a splendid crop of handsome fruit, which found a ready market at fair prices.

The scarcity of fruit in many other sections induced buyers to come to Pennsylvania, who would not otherwise have done so. As a consequence, Pennsylvania fruits, especially apples, have been distributed over this country as they have never been before, and the men who bought our fruit this year will come back again for more.

Some of the remedies that have been used for the control of scale have proven effective, and the reports come from all sections that the orchards are in much better condition than they were at this time last year.

The advent of the San José Scale frightened many orchardists into studying the spraying problem, and after they had secured the proper machinery to spray for scale, we find the great majority pruned and cleaned up their orchards and sprayed also against the codling moth and fungus diseases. As a consequence we never had in Pennsylvania as many carefully sprayed, intelligently cared for orchards as we had this year, and we never had as uniformly good a crop of fruit.

This excellent crop of fruit and the ready market that it found, added greatly to the popularity of the county horticultural societies. We find that they all report increase of membership and a much greater interest in the work of the societies; plans for more extensive planting have been arranged for next spring, and in every case we find these plantings will consist of a very few varieties that seem to be specially adapted to the particular locality.

The investigations in horticulture by Prof. Stewart, under the auspices of the State Experiment Station, have been fairly started, and will very soon begin to show results. The State of Pennsylvania is to be congratulated upon the public spirit manifested by the orchardists of the State in offering their hearty co-operation and the use of their land for these experiments free of cost. In this age of graft and extortion, it is refreshing to find one set of men who are willing to do somthing for the public good without special gain to themselves.

The Horticultural Department of State College has been re-organized and every facility will be afforded for the study of horticulture in all its branches, including market gardening and the management of greenhouses, hot-beds and cold frames. A commercial market garden and small fruit project will be started in the spring, so that the students can pursue their studies from a business standpoint. This department will be in charge of Prof. R. L. Watts, the ex-Chairman of our General Fruit Committee, with whom most of you are acquainted. He is a thorough scientist, an excellent teacher, and at this time one of the most successful market gardeners in Western Pennsylvania. I feel that we are exceedingly fortunate in securing his services. In this connection, the most hopeful sign, to my mind, is the fact that a number of young men are already enrolled in this course, with the intention of taking charge of the home farm.

While congratulating ourselves upon the bright prospects for horticulture at State College, we cannot forget the great loss the college and our Society has sustained in the tragic death of Prof. Geo. C. Butz, who was cut down in the midst of a useful career. He was an authority on all horticultural matters; he was justly popular in every county of the State where he lectured at Institutes, because of his accurate knowledge of his subject, his untiring industry, his modest, unassuming manner, and his genial, kindly nature, which endeared him to every one who knew him.

And now, what can we say for the year upon which we are about to enter?

Each grower should have a definite, distinct idea formed in his own mind as to what special results he wishes to secure; what kind of trade he is going to cater to, and always towards this one end. If you will go persistenly after a particular line of trade, study its needs, and do your best to supply them honestly, you must succeed—failure is out of the question.

We should encourage the association or community spirit in our work. When we go into the general market we find the different interests co-operating against us. The railroads agree together as to the rates they will charge for carrying our produce to and from the distributing centers. The commission men agree as to the rates they will charge for selling, and where they find men working single-handed, they fix the price at which they must sell. When the men of a certain district work together, study business methods together. study the crop and market reports together and stand together for a square deal, they will get it. I am glad to be able to say from personal observation, that this community spirit is growing, and where it is most pronounced we find the most enthusiastic fruit growers, the best citizens and the happiest families.

To the young man who is about to start inbusiness for himself, and contemplates planting orchards, I would say, don't allow your fondness for large operations to induce you to undertake more than you can well perform. I have always been a strong advocate of the little farm, well tilled. My experience and observation, extending over a period of more than thirty-five years, has taught me that a few acres judiciously planted and properly cared for, is much more profitable than the large farm poorly cultivated and the crop carelessly handled. In conclusion, I wish you all a prosperous and happy New Year.

HORTICULTURAL ADAPTATIONS.

By Thos. F. Hunt, *Dean and Director of Agriculture and Experiment Station. State College, Pa.*

Although my father was something of an orchardist and a great lover of trees, my own experience, especially in later years, has been along the lines of more extensive agriculture. I cannot, therefore, speak with any authority upon the details of horticultural operations. As the director of your Agricultural Experiment Station, however, I have to consider your problems in their broader aspects. You have, as I see it, a couple of large questions which need working out if Pennsylvania is to take the place in fruit raising and vegetable gardening that her natural conditions warrant. Some persons will doubtless say that the discussion which follows has failed to mention the most important question in fruit raising, namely, the marketing of the crop. I do not wish to underestimate the importance of barter, but the most important element of success is the economic production of a high-class article, whether it is the apple, iron or broadcloth. The people of this nation have gone wild on the subject of barter. If the men who have amassed fortunes in selling cheap, spurious or adulterated articles had spent the same energy in studying the economic production of a high-class one, they might possibly have made as much money and saved their souls at the same time. At any rate this country would have been spared the expense of an army of detectives to enforce the pure food and similar laws.

The Pennsylvania Agricultural Experiment Station has a moderate sized poultry plant. Apparently, the only cause for locating the buildings and yards was the fact that it seemed convenient to locate them along a roadway leading from the station office to the station barn. The station barn was located in its present position because a side hill barn was desired, and the station office building was located doubtless to give a sightly outlook. Obviously, these factors have nothing to do with raising poultry, and now experts tell me that our poultry work, if not a failure, is at least handicapped owing to the fact that this accidental location is unfit for poultry and is causing us to work against nature.

The location of most family orchards and some commercial ones is equally accidental. How many orchards in Pennsylvania have been located with reference to the farm buildings. Few men have deliberately studied the soil and climatic adaption of different parts of their farm, but they just planted an orchard where convenience, generally in relation to the dwelling, has indicated. Some brilliant successes in orcharding and many dismal failures have been due to the accident of placing the right or wrong kind of variety of fruit on the right or wrong soil, yet it is now known that in the same orchard part of the land may be adapted to Baldwins, another part to Rhode Island Greening and so on. The point is that if orcharding is to take a large place in Pennsylvania, and I believe it is possible to put this great Commonwealth at the head of the column, both in the yield and quality of apples, at least, then a systematic campaign of education must be begun by this Society and all other agencies designed to better the fruit industry of the State, to teach people that commercial orcharding should be restricted to those sections where, by virtue of soil and climate, man is aided by nature in the production of apples and other fruit. Not only so, but people should generally recognize the necessity of adapting the kind of fruit, or even the variety, to both soil and climate conditions. We must even go farther and recognize that certain varieties require different treatments. A friend suggests that in planting an orchard the following plan be followed:

1	2	1	2	1
3	4	3	4	3
1	2	1	2	1
3	4	3	4	3
1	2	1	2	1

In the above outline each number represents a variety of apples. If we suppose each tree was planted, say twenty feet apart, each way, then, ten years later, when it was decided which one of the four varieties was best, considering yield, quality and market conditions. the other tree could be removed. It is evident that it would make no difference which variety was left, as the trees of every variety are exactly the same distance apart. Now, my friend has pointed out one objection to this method which he deems rather serious; how serious I must leave it to the expert to decide. He says that in his own experience different varieties of apples require different strengths of sprays, and that if four varieties were thus interspread one might find difficulty in getting the best results in spraying. I bring this question up here only as an illustration of the possible adaptation of varieties or kinds of fruit to methods of management.

While the adaptation of present well-known varieties of fruit to different climatic and soil conditions is the first and probably the most important subject in promoting fruit raising, yet it is possible to go a step further. The Pennsylvania Agricultural Experiment

Station is about to plant a large orchard on Hagerstown clay loam. It wishes to grow three varieties of apples. Who can tell us what three varieties to grow? Since this soil type is seldom used for commercial orcharding, we have little knowledge of the varieties adapted to it. It is entirely possible that there is no well known variety of apple adapted to this soil type, at least when raised upon a commercial scale, but it is possible that some variety may be found which would outrival any known variety, or it may be that it would be possible to create a variety better than any yet known for this purpose. This illustration has been given to show that there lies before our door great opportunities to discover or create varieties adapted to special soils and climates. The people of this country have been in the past few years, made quite familiar with the work of Luther Burbank. It does not detract one iota from that work to call attention to the fact that Burbank's creations, so-called, are of little value usually to the horticulturists of the East, because of differences in soil and climate. The very fundamental laws that permit him to do what he does in large measure prevents his work from being of practical value to eastern horticulturists. What he has done is to call attention to what it is possible to do for each locality, and then each locality must work out the problem for itself. While the creation of new varieties of fruit may be dealt with in some measure by the experiment stations, it is a line of work peculiarly adapted to individual effort and one that this society can wisely promote as such.

While I hesitate to make suggestion as to practical details to the members of this society, there grows, out of the idea that certain varieties have certain soil and climatic adaption, the need of greater care in the selection of stock. The time has come, in my opinion, when no apple grower should buy a variety of apple for planting, but the orchard should be planted from some suited stock such, say, as Northern Spy, and afterwards top grafted from carefully selected scions, preferably from trees grown under the same soil and climatic conditions. Not the least of the arguments in favor of this practice is the positive knowledge that when the trees come into bearing they will bear variety of apples expected.

There is still another step in the study of horticultural adaptation. If certain soils are adapted to the raising of certain varieties of fruit or to a particularly high yield or quality of a particular variety of fruit, then there must exist certain conditions in that soil which brought about the results. Granting this, we have only to discover these conditions and bring about the same conditions in other soils in the same climate to get the same yield or quality. This may sound simple to the uninitiated, but every person who has ever turned a furrow knows it is not.

A year ago last December, at the suggestion of two horticultural societies of this State and upon the recommendation of the Director-elect of the Station, the Board of Trustees of the Pennsylvania State College set aside $1,800 of the Adams fund for the fiscal year ending June 30, 1907, and later set aside $2,700 for the fiscal year ending June 30, 1908, for investigations in horticulture. At the annual meeting of the State Horticultural Society last January the speaker consulted with members of your Society, and it was decided that the most important subject for investigation with this fund at this time would be the causes which affect yield and quality in apples. On April 1, 1907, Professor John P. Stewart was elected to take charge of this investigation. In a circular, which was issued at that time, it was stated that "so broad a subject and one involving such fundamental questions will be a long-time experiment and can only be accomplished by the most cordial co-operation of the orchardists of the State in whose orchards these investigations must be conducted, if the questions involved are to be settled. Just what phases of this general inquiry will be taken as first will not be decided upon until a study of orchard conditions within the State has been made, but the following points have been suggested and are under consideration: (1) influence of commercial fertilizers and barnyard manure, (2) influence of cultural methods, (3) effect of types of soil, (4) influence of climatic conditions, including elevation and exposure, (5) effect of scions from different trees, and (6) the influence of amount and time of pruning. The influence of fungus diseases and insect enemies will not be overlooked, although they may be made the subject of immediate investigation."

Definite experiments on two phases of this general inquiry were started last spring, three on the effect of fertilizers and four on the effect of cultural methods. The experiments on fertilization are in operation in the following orchards: In Adams county, at Mr. E. C. Tyson's, Floradale; in Franklin county, at Mr. D. M. Wertz's, Quincy; in Bedford county, at Mr. S. M. Brown's, Mann's Choice. They involve sixteen plots of ten trees each, thus comprising a total of 480 trees now under fertilization experiment. The cultural method experiments are in operation in the following places: In Franklin county, at Mr. J. H. Ledy's, Marion, and at Mr. John A. Nicademus', Waynesboro; in Bedford county, at Mr. Joseph R. Sleek's, of New Paris, and in Wyoming county, with Mr. F. H. Fassett, Meshoppen. These experiments, with the exception of the last, comprise eight acres each and involve a comparison of the four leading methods of orchard culture, both with and without fertilization. Also, they compare each method as fertilized with barnyard manure versus commercial fertilizer. In all, seven experiments, covering forty acres, in four different sections of the State.

Pennsylvania State College has recently purchased 197 acres of land and has set aside something over twenty acres on which, in the spring, an experimental apple orchard will be planted, covering a number of phases of general inquiry above mentioned. It is expected also to establish additional experiments in other apple sections of the State. Careful observations are being made on the influence of types of soil and climatic conditions by Professor Stewart. The most important work of this kind, however, is being done by H. J. Wilder, of the Bureau of Soils, who, during the past season has been making a careful study of the apple soils of the Appalachian region, from New York to Georgia. I mention this matter here in order to suggest that if you wish to have this work continued, this Society should take suitable action to secure Mr. Wilder's assignment to this and adjoining states for next season.

In reporting to you on behalf of The Pennsylvania State College, our stewardship in its relation to horticulture, I am compelled to report the loss of George C. Butz, Professor of Horticulture, by death, on Dec. 14, 1907. Professor Butz graduated from The Pennsylvania State College in 1883 and for about twenty-five years has served the horticultural interests with all his power. He was idolized by his students and beloved by all who knew him. This Society will, of course, take suitable action concerning his death.

I am able to announce the election as Professor of Horticulture, of Ralph L. Watts, Scalp Level, Pa. Professor Watts graduated from The Pennsylvania State College in 1890. He was at one time Professor of Horticulture and Director of Farmers' Institutes at the University of Tennessee, but, fortunately for Pennsylvania, resigned from that institution to engage in commercial vegetable gardening and small fruit raising in Cambria county, where he has been unusually successful. His knowledge of the subject, his ability as a teacher, his acquaintance with horticultural conditions throughout the State, as well as in other states, makes his appointment a particularly happy one. I thank you for your kind attention.

LIFE HISTORIES OF SOME COMMON ORCHARD INSECTS.

By H. A. Surface, *Economic Zoologist of Penna.*

As a rule, fruit growers and farmers recognize insects only in their most destructive stages, if at all, and in fact they more frequently recognize the destructive effects of the insects than the pests themselves. For example, it is not un-common for us to receive fruits or twigs speckled with red, sent with the supposition that they contain the San José Scale, because this pest often causes red spots in the tissues of the plant where it is found. However, such conditions may come from fungus diseases or other causes and do not always mean the presence of the San José Scale.

It is important for fruit growers to recognize the effects of pests on crops, because they are often conspicuous when the pests themselves can not be seen, and in many cases they are so distinctive or characteristic as to make it possible to diagnose correctly the cause of injury, and thereby obtain the key to the application of proper preventives or remedies.

Destructive insects should be known in their different stages, and their life histories and places of living and places of concealment should be understood by farmers and fruit growers, in order that the pest can be attacked at their weak or vital points.

In speaking of the life histories or stages of our insects, it should be understood that we have two great groups of insects, classed according to the nature of their change of form or metamorphosis. The representatives of the first of these groups are said to have incomplete metamorphosis, or change, because the young resemble the parents in nearly every regard excepting that they do not have wings and are smaller. Also, they do not have a chrysalid or resting stage, and thus there are but three stages in their life history: The egg, the nymph or wingless young, and the adult or imago, which is represented by the winged form in all species having wings. The insects of the second group are said to have completed metamorphosis, as their change is more distinct, comprising four stages: the egg, the larva or worm-like stage, the chrysalid or pupal stage, and the adult or imago.

The insects do all their growing and often all their feeding in the second stage, which is that of the nymph or larva. It is consequently in this stage that they are generally most destructive. They do not grow after the wings have developed, and many have no mouth parts fitted for taking food in the adult stage, and consequently can not feed in this last stage. Sometimes the injury by insect pests is done by the female in depositing her eggs, while the injuries by feeding are not conspicuous. The work of the Cidada or "Locust" is an example of this.

In the following remarks, insects will be discussed according to the plants they infest, but it must be remembered that some insects are liable to attack a great many varieties or species of plants, while others may be limited to but a few or even one only. When an insect like the codling moth is described under "Apple," this does not imply that it attacks no other fruits, and the description of its work or effects, for the fruit under which it is discussed is practically the same as for its effects on any other fruit or plant. If the description and name can not be found under one particular kind of plant, it should be sought under another, which it may also attack. Details of remedies have been published in previous issues of our bulletins, and may be further published in the May issue.

Apple Pests.

Aphids or Plant Lice.—These are small, round-bodied, greenish insects, with two long antennae or feelers, and a piercing mouthpart, by which they pierce the tissue of the leaf or growing twig and suck the juices, after having injected a saliva that is more or less detrimental to the tree. Plant lice belong to the group of insects without metamorphosis, and consequently they do not have a worm-like larval stage. The apple aphis remains during the winter in the form of black, shiny eggs on the twigs of the tree. At this time spraying with such insecticides as are effective in killing scale insects will destroy them. About the time the buds are bursting, the young aphids hatch from the egg and commence to suck the juices from the new green parts. This is the best time to kill them by mild contact sprays, such as dilute whale oil soap, eight per cent. kerosene emulsion, tobacco decoction, or dilute soap washes of other kinds. As they feed on the undersides of the leaves, the infested leaves become deformed or twisted and curled in such a way as to form protecting places for the insects within, and sprays can not reach them. Consequently, after the leaves are curled, it is impossible to kill them by spraying, but if delayed until then the infested twigs may be bent over and dipped into pans containing the contact insecticide, or the leaves may be picked and destroyed.

The Codling Moth.—The codling moth is the insect that feeds on the seeds and around the core of apples, pears and quinces. In its destructive stage, it is a pinkish white larva, which comes from an egg laid on the fruit or leaf by a small winged moth, which flies by night and is properly called the codling moth. This egg is laid about the time the trees are in bloom, and shortly after the flowers fall the little larva or worm hatches from the egg and generally crawls to the blossom end of the fruit, where it usually makes its entrance. There is no remedy for it after it has entered the fruit, but if a spray of arsenical poison be used at the right time, it will be killed with it when it takes the poison in attempting to gnaw through the surface of the fruit to reach the interior.

The best remedy is arsenate of lead, two or three pounds in fifty gallons of water, and the next best is Paris green, one-third pound in fifty gallons. Instead of using the poison in water alone, it is yet better to make the Bordeaux mixture by the use of four pounds of bluestone and six pounds of lime in a fifty-gallon tank or barrel of water, and add the poison to this. For pears, apples and quinces this formula is all right, but for peaches and plums it should be reduced by using one-half of the materials in the full amount of water.

To prevent the further appearance of the codling moth, fallen fruits should be destroyed as soon as they drop, either by gathering them or by keeping pigs or sheep beneath the trees. Also, bands may be put around the trees in midsummer to catch the larvae which may there spin their cocoons and transform into their winged stage. However, if the bands be not examined at least once per week to kill the insects that collect beneath them, they are worse than though nothing had been used, for the reason that they will furnish hiding places for these pests rather than force them to transform where woodpeckers and other natural enemies would be liable to find and destroy them.

The spraying for the codling moth should be done just after the petals or flowers fall, and again in a week or ten days from that date. There are two broods of the codling moth per year, but if the spraying be thoroughly and properly done for the first brood, it will not be necessary to spray in July or August for the second brood.

The Bud Moth.—This is the insect which does its destruction when in the larval or worm stage, by eating the interior of the buds of apple and other trees. The chief destruction is done in spring and may be quite serious, because the undeveloped leaves are then so small that one bite may cause deformity of an entire leaf as it further developes. For the bud moth, spray with arsenate of lead or Paris green as soon as the buds burst and the green leaves are showing, and repeat just before the blossoms open. Carefully avoid spraying blossoms when in bloom.

The Apple Leaf Miner.—This comparatively new destructive insect makes a mine or tunnel in the green tissue of the leaves between the two layers or coverings, and as several may occur within one leaf they have a destructive effect and result similar to that of the frog-eye. The mines or tunnels made by this insect can easily be recognized by the fact that they are trumpet-shaped or worm-like in appearance. The larva which makes them transforms into a pupa and in the spring developes into a very minute moth which lays the egg on the leaf, and the larva hatches from this. Where this pest occurs. the leaves should be gathered and burned as completely as possible. A spraying of arsenate of lead and Bordeaux mixture kept on the leaves during the spring and the early summer destroys the young larvea at the time they hatch from the egg and before they are concealed within the leaf, is the only practical remedy that can be offered at this time, besides the destruction of infested foliage or fallen leaves. It is urgently requested that persons should also watch for this insect and send reports and samples of infested leaves to our office. Special attention must be given to this pest in this State before it spreads further.

The Scurfy Scale.—This is one of the older scale insects on fruit and shade trees, given its common name from the fact that it resembles a flake of scurf or dandruff, such as is sometimes seen in the hair. The female is gray and fan-shaped and about the size of the letter "v" used in this type. The male is quite small and narrow. being no larger than the body of the letter "i" in this print. Beneath the scale of the female is to be found the purple eggs during the wintertime and about midsummer. There are two broods per year, the first hatching about the third week of May and the second hatching during the early part of October. The life history, effects and remedies are practically the same is for the oyster-shell scale. Spraying when the trees are dormant with such insecticides as are recommended for the San José Scale or spraying just after the eggs hatch with mild contact insecticides, such as are recommended for aphids or plant lice, is advised.

The Tent Caterpillar.—As common and conspicuous as this pest is it is often confused with other species of caterpillars or larvae of moths. This name is given only to those hairy caterpillars which hatch from a band of eggs encircling the twigs of cherry, peach, wild cherry and a few other trees, and from tents of thick white sheets of webbing in the forks of the branches on the trees, during the months of May and June. The tents may remain in a more or less dilapidated condition during all the year, but the worms or caterpillars do not remain in them after the latter part of June. This term should not be given to the web worms, which construct loose web coverings over the leaves of various fruit and forest trees later in the year, nor should it be given to the caterpillars that denude walnut trees and form bunches of cast skins on the trunks. Tent caterpillars are to be killed by clipping off the egg masses during the winter and spring, and by spraying with arsenical poisons as soon as they appear and commence to form their tents in the spring and by removing their tents with a brush on the end of a pole by shooting them out of a tree with a shot-gun loaded with only powder and paper. If a torch be used for burning them out, it can be made effective, but is liable to injure the tree. unless one be careful to have it near the branches only a very few minutes.

Wooly Aphis.—This is a dark blue plant louse, which secretes a white waxy or wooly substance over its body that protects it from cold, heat and water, and also from its enemies. The white covering and the number of these insects together form what resembles a small tuft of wool, and the common name is derived from this fact. They may live on the roots of trees or on the trunk, branches or leaves. Where there are injured spots the wooly aphis is especially liable to be found and by its continuous injection of a poisonous saliva and the sucking of the sap of the tree at each place. it causes a permanent injury and often results in the formation of knots or galls. When it occurs on the roots of trees the best remedy is to uncover the infested roots and put immediately over them a liberal sprinkling of finely ground tobacco leaves or tobacco dust and replace the soil. The wooly aphis above ground can be killed by painting or spraying the spots which it infests with strong soap solutions, oil emulsions, strong tobacco decoction or any other contact insecticide.

Cherry.

Cherry Aphis.—The cherry aphis is a plant louse, but instead of being green in color, as are those which have been previously discussed, it is of a dark brown color. The brown aphis is also sometimes found on peach. The plant lice of this color are more hardy or less easily killed than are the green aphids or plant lice. I have several individual records of their having been destroyed and the trees cleaned nicely by the use of the boiled lime-sulphur wash applies in the spring while the buds were swelling. We recommend this for cherry and peach each year, whether the San José Scale be present or not. Also a strong solution of whale oil soap, one pound in five gallons of water, strong tobacco decoction or kesosene emulsion supplied as a spray, will kill them.

Curculio.—The cherry curculio is the insect which makes wormy cherries and causes untold annoyance to the housewife, and in fact considerable loss to the crop. This is the pest the work of which is too well known to need description. The damage is done in the larval or grub stage from which it enters the ground, transforms to the pupa and remains over winter to come out in the spring in the form of a small cuculio or snout beetle. To present this the trees should be sprayed with arsenate of lead and Bordeaux mixture, using two or three pounds of arsenate of lead in fifty gallons of Bordeaux just after the buds burst but before the blossoms open and again with the same liquid soon after the petals or flowers fall, and this spray should be repeated again in a week or ten days. The curculio can be caught by jarring the trees over a sheet of cloth spread or held beneath them. It is advisable to cultivate the ground about the middle of July under infested trees and permit fowls to run in the orchard or yard where cherries and plums grow. Pick off the fruit that indicates that is is stung or infested and feed to the poultry or pigs and have fowls ready to destroy the fruit which falls early because infested.

The Leaf Slug.—The cherry leaf slug is one of the slug-like insects resembling a shellless snail, which lives on the leaf by devouring the epidermis, and causing the leaves to appear brown or scorched. It is a moist, dark, almost shapeless mass and is one of the most easily destroyed insects that infest the foliage of fruit trees. Similar slugs destroy the leaves of plum and pear trees and are to be killed by dusting with freshly slaked lime, and one part of Paris green should be added to twenty parts of lime, or by spraying with any of the arsenical poisons or dusting with hellebore. Any of the spray liquids for killing leaf-eating insects, such as caterpillars, will destroy these slugs, and because their bodies are slimy and moist they are killed by the lime dust the same as are the asparagus beetles.

The Beetles, or Coleoptera.

Belonging to the "hard-shelled" insects, or Coleoptera, generally known by their common name of Beetles, are many species, which in both the adult and larval stages attack vegetation either above or beneath the surface of the ground. These insects have four distinct stages in their life history, recognized at once as the egg, the grub or larva, the pupa, and the imago or adult.

Among the insects which are very destructive, both in the larval or grub stage, and in the adult or beetle state, is the one commonly known as the May Beetle, May Bug, June Bug, Dor Beetle, Drone Beetle, and other common names in the adult or winged stage, and familiar as the White Grub or "Grub Worm" in the larval stage. There is at most, but one brood of this insect per year, the adult appearing in May and June, sometimes flying around lights at nights, in great number, and feeding at night upon the leaves of trees. They eat or cut away a great amount of the foliage. The eggs are laid in the ground, generally at the roots of grasses or other kinds of vegetation, and the larvae there feed and grow. Their growth and transformation are slow, some species requiring two or three years for the completion of life in the larval stage. They then pupate or transform to chrysalids in cells in the earth, in which they pass the winter and come forth as the familiar large round June Bugs or May Beetles belonging to the springtime.

These insects remain and feed in the ground to such an extent as sometimes to eat the roots of the grass entirely away, turning it brown and making it possible to roll it back like the fleece of sheep. Where they are present in lawns we have used Carbon Bisulfide against them with success. Make a hole at a depth of about a foot, using some pointed instrument like a stick, and pour at least one-fourth teaspoonful of Carbon Bisulfide into each hole, making about three of them to each square yard of ground to be treated. Tramp the holes tightly after pouring the liquid in and thus prevent its too rapid evaporation. Where the pests are common in the soil in greenhouses and even in gardens they are to be killed by poison bait, such as poison bran mash, the same as cutworms. It is particularly important in orchards to keep the ground clean of weeds and grasses as these pests can be suppressed without difficulty by clean cultivation, which is likewise best for trees.

* * * The Flower Beetle, or "Fig-eaters," are insects which in their larval stage are grubs feeding upon organic material, such as manure, or sometimes the roots of plants, and their mature stage they are liable to attack leaves and fruits, injuring them severely. There is also not more than one generation or brood of these per year. The life history is similar to that of the June Bug or May Beetle, and the remedies are practically the same. For both pests it

becomes important to avoid placing fresh stable cleanings in hills where plants are to grow. Use either well rotted manure or plow the fresh cleanings down well beneath the surface of the soil.

* * * More visible damage is done to rose bushes by the Rose Beetle and more inquiries are asked concerning its destruction than any other coleopterous insect found in this State. This may be because of the wide range of food plants for this pest, and also because there is no good remedy for its immediate suppression, and it often feeds unchecked for some time. As we commonly see it, this insect is only in the adult or fourth stage. The life history should be understood, and is as follows: "It passes its early stages in grass on meadow land, especially if sandy—the larvae feeding on the roots of grasses a few inches below the surface of the ground like the white grub, which they closely resemble except in size. The eggs are laid in the ground in June and July and the larvae becomes full grown by autumn and transform to pupae the following spring, from two to four weeks prior to the emergency of the beetles." (Year Book of the Department of Agriculture for 1895.)

This familiar insect is commonly known as the Rose Chafer, Rose Bug, Rose Beetle, and Cherry Bug. It attacks not only roses, but fruit trees and fruits of many kinds, especially cherries and grapes. It eats irregular ragged holes in the leaves, and eats the young grapes from the bunches or stems on which they grow. It is familiar as a common and destructive pest.

The remedies for it are not always successful, and no simple and satisfactory remedy is known. It is generally not killed by spraying with arsenites for the reason that it takes nearly two days to kill it by poisons. They poison so slowly that the beetles which have eaten the poison may die and disappear only after recruits have appeared, and thus the operator will be led to think that the spraying has not been sufficiently efficient against them. It is recommended to spray them with a wash made by diluting one gallon of Crude Carbolic Acid with one hundred gallons of water. Fairly strong soap solutions and kerosene emulsion will also kill them. One of the best means of treating this pest is to shake it over cloths well soaked with kerosene oil and spread beneath the infested plants to cause the insects to come in contact with oil. If an insect once falls on an oil-soaked blanket it will be killed, even though not entirely covered with oil. Picking by hand is also recommended, and where the infested plants are but few in number it is advisable to pick or shake the beetles from the plants into pans of water carrying oil floating on the surface. Where other means fail it is advisable to resort to bagging grapes, or placing paper bags over them, to protect them and also protect plants with netting. As those insects prefer leaves of spirea and white rose it may be found advisable to plant some of these near the grape vines to entice the insects to them, when arrangement could be made for spraying the infested bait plants or otherwise destroying the pests on them, and thus preventing the injury to the grape, cherry and other fruits.

As the larvae feed on the roots of grasses, bushes, and other vegetation, it is practically important in subduing the Rose Chafer that the sandy grounds where they are abundant be cultivated so that the pests will be destroyed in their larval stage and will not come to maturity.

* * * Among the leaf-eating insects that are very troublesome and injurious to vegetation are the Flea Beetles. One of these known as the "Steely Bug" attacks the grape vine to such an extent as now properly to be called the Grape Vine Flea Beetle. As the larva feeds on the roots of the plant which it attacks it is also called the Grape Root Worm. It is one of the most serious pests of the grape. The egg is laid in the summer at the roots of the grape and the larva hatches and feeds on the roots during the summer, pupating in the ground, spending the winter in this condition and place. and appearing in the early spring as the adult, leaping and flying beetle, which at once attacks leaves, making many small rounded holes in them. In its mature state it attacks the grape leaves, and in its larval stage it is injurious to the root. Spraying with arsenate of lead as soon as the adult beetles appear in the spring is one of the best measures, and frequent cultivation of the soil near the roots of grapes during spring and fall is to be recommended.

Flea Beetles on potatoes and other crops are often to be seen jumping readily, like fleas, and hence given their common name. Of course, they are not fleas, but true beetles, with chewing mouth parts, with which they gnaw small holes in the leaves. The Potato Flea Beetle may be so abundant on the vines as to cause the leaves to turn brown from their effects. They can be prevented by spraying with the Bordeaux mixture, with arsenate of lead or Paris green added. Use the same formula as for spraying for the codling moth. as given in our May Bulletin.

* * * Among the borers of our tres is a group known as Long-horn Borers. These are so named because their antennae or feelers are of unusual length. The Long-horn Borers in their adult stage are beetles of rather elongate slender body and a pair of immensely long antennae, like threads, on the head. In the larval stage they are familiar to fruit growers as borers beneath the bark and also in the wood of apple, pear and quince trees. The common name is given because the front portion of the larva is rounded and not flattened.

The evidences of borers are to be seen in discolored flattened spots of the bark, under which are the burrows, or by very fine holes made by the larvae where they enter, or by fine grains of sawdust made by the mature or full grown larva when in bores to the outer side of the bark to make a hole through which it can push as a mature beetle after it completes its transformation. After making such a hole it withdraws into its tunnel and forms its chypsalis. In this stage it remains during the winter, coming forth in the spring as a mature insect.

Wherever borers are found they should either be cut out, or pierced by sharpened soft wires stuck into their holes, or, better. destroyed by injecting a fluid known as carbon bisulfide into their holes, using a spring bottom oil can to give the injecting force. Plug the holes with putty or mud and let them remain.

Get the borers out of the trees by cutting, piercing, or injecting, and then keep them out by painting the trunks of the trees not later than the middle of June each year with pure white lead and raw linseed oil, or with boiled lime-sulphur solution, or with the commercial preparation known as Tree-Borer Paint, which is really a commercial lime-sulphur wash with adhesive qualities, which sticks like paint. Two coatings of this material during the summer, applied about the middle of June and the middle of August, should be sufficient to keep the borers out of the trees. We have tried white lead and linseed oil on our own peach as well as apple trees, and have found no evidence of injury to any of the trees from painting with it. We recommend prevention of tree borers as being far more important than any remedy after they have entered.

* * * The Flat-headed Apple-tree Borer is also a serious pest of apple, pear and quince. It is not the larva of a Long-horn Beetle. but belongs to the Buprestids or Metallic Beetles, so called because the wings have a very decided metallic lustre when seen in a certain light. The life history of the Flat-headed Borer is similar to that of the Round-headed, the egg being laid on the bark about mid-summer by the adult beetle, the little larva boring through the bark and feeding beneath it and reaching its maturity in its cell or tunnel from which it cuts a hole while yet a larva, and makes its exit after it becomes mature. It then transforms into a pupa and remains quiet during the winter to come forth as an adult beetle in the spring time. The remedies are exactly the same as for the Round-headed Borers, and the preventatives are also identical. It would pay well to paint the trunk of apple, pear and quince trees for borers, mice and rabbits.

* * * There are certain twig borers which are at times to be found boring in the twigs of fruit trees. Oftentimes the hole is to be seen going downward from the axil of a leaf stem or fork of a small twig. This hole has been made by a wood-boring beetle or its larva, the examination should at once be made for the pest. When the twig looks yellow or wilts or shows signs of dying it should be cut off and split open, and if a borer be found present, it should be destroyed. By watching carefully the evidences of the presence of such insects, they can be found and their accumulation in such numbers as to become a plague can be avoided without much trouble.

The Twig Girdler is a beetle which cuts off the twigs for the nourishment of the young which come from eggs laid in the twigs. This beetle is to be destroyed by gathering and burning the twigs in September. As a rule it is not very abundant, but it may sometimes appear in destructive numbers.

* * * The Bark Beetles or Shot Hole Borers are among the most conspicuous pests of this State and are often thought to be among the most destructive, but as a matter of fact they are not so injurious as is supposed, for the reason that they attack only trees that are dying and thus merely hasten their death. When a tree has recently died it can often be seen full of holes, looking as though it had been shot into by a shot gun carrying fine shot. This is why they are called "Shot Hole Borers." There is no remedy for

them, and the best step on finding evidence of the Shot Hole Borer in a branch is to cut it off and burn it at once. They may often attack large branches or one particular branch in a tree without attacking the rest of the tree. If they be not destroyed they are liable to spread to other trees and aid in their rapid decline. They should be killed by promptly cutting and burning all infested trees.

* * * The last group of beetles to be mentioned at this time are the Curculios or Snout Beetles, which injure leaves in the early spring by eating small holes in them while they are yet very small and quite undeveloped, and consequently making decided and conspicuous injury, but particularly effect much damage by puncturing the fruits of our cultivated trees, especially plum and cherry, and laying therein eggs from which hatch larvae that becomes "worms" of wormy fruit of such variety. The life history of the curculio of peach, plum, and cherry is as follows: A hole is made in the fruit within a few weeks from the time the blossoms fall, and a small white egg is placed therein by the Snout Beetle or Curculio. From this egg hatches a larva which feeds within the fruit until it reaches maturity, and either drops with the fallen fruit or otherwise falls to the ground, just beneath the surface of which it pupates or becomes a chrysalis, there remaining during the winter to appear again in the early spring as an adult or mature insect.

THE ORCHARD, ADAPTATION OF SOIL TO VARIETY.

By Prof. Henry J. Wilder, *Bureau of Soils, Department of Agriculture, Washington, D. C.*

Mr. Chairman, Ladies and Gentlemen: I want to talk to you a few minutes about one of the factors in fruit growing which, very strangely, has received little attention until recently. In planting an apple orchard, the first subject for consideration is its situation with respect to drainage of both air and water, then exposure, and regional or climatic adaptation to variety. These factors may readily be determined by superficial observation, and very often are the only ones considered, as many think the character of the soil makes little or no difference if the other conditions are right. But the fact is already well established that after these factors have been decided upon, the consideration of the kind of soil is of utmost importance, not only as to its general adaptation to orcharding in that it is "deep and well drained"—often the only factors considered—but particularly with a view to planting each variety in the kind of soil where it will produce the most of the best variety of that particular variety of fruit, for there is no longer any doubt that certain varieties at least have a very decided preference for soils of certain characters and that such varieties should be planted commercially on those soils only, which produce them to the best advantage. For it needs little argument to show that a given variety grown upon a soil which contributes most ideally to its production will have little or no competition from the same variety grown upon a soil less suited to its requirements.

Now, in general orchard planting, the intelligent farmer has succeeded in avoiding such hilly localities as are underlain by flat rock formations of sandstone or shale. This refers particularly to the shale hills where the shale lies close to the surface. And he has also avoided low, flat and poorly-drained areas—that is, he has shunned the extreme soil conditions which were manifestly not adapted to fruit growing. But how is he going to avoid soils which judged by the same outward manifestations, should be good, whereas they are actually unsuited to orcharding? For the texture and structure of soils in their under strata is frequently such as to produce precisely the same or similar effect on the growth of the orchard and the quality of the fruit, as the thin or wet conditions already mentioned. So let us consider for a few moments the soil preferences of a few representative varieties and for this purpose I have chosen varieties to illustrate the general range of adaptation from the heavy to the light soils.

The first variety to be considered is the Rhode Island Greening, which you do not want to grow in this immediate vicinity, but in the northern part of the State, where the soil is different, it is a good variety; also, in New York and in New England. The Rhode Island Greening does best on a heavy, silty loam surface soil, with enough organic content to give it a dark brown color, but not enough to give it the black color of the Albemarle Pippin soil. The subsoil may range from a heavy silt loam to a silty clay loam, that is a subsoil rather heavy, but still plastic and workable, not stiff and intractable. A good moist, yet well drained, corn and grass soil that produces at least a moderate growth of corn, which retains a good green color until harvesting.

If we go farther south, in Pennsylvania and West Virginia, etc., this soil is also the ideal for the Grimes—an apple of high quality which has become very popular, and is being planted extensively in the region mentioned.

For the Northern Spy much the same kind of soil is desired, only it should be a little less moist, i. e., with just a little lower content of clay and silt—nor can it utilize quite as low positions as the Greening, and it needs more sunlight to bring its most desirable color and flavor. I might relate an occurrence which happened in Western New York a few days ago, when I made a statement similar to this about the Northern Spy. A man brought me a couple of Spies, and asked me what I though of them. I said they were as fine on the exterior as any I had ever seen, finely colored and well developed. He said: "I grew them on the soil that you said was not adapted to them." I said: "It looks as if I was mistaken then, doesn't it?" Now we know that the flesh of this variety should be very tender and juicy, with crisp texture and high flavor. We cut one of those apples and found it very coarse-grained, the flavor was not good, and it lacked the tender, juicy quality, characteristic of the Northern Spy. This illustrated very forcibly, I thought, that the Northern Spy has a preference for certain soil conditions.

We will now go farther south and consider the Mammoth Black Twig, a variety adapted to the general region between Virginia and Arkansas. It is a good apple, of so much promise that extensive plantings have been made of it, and it would be very profitable if it would bear good crops, but often it has been so deficient in this respect that it has been a great disappointment to many. If planted on a rather thin soil, however, such as a shale loam, where the wood growth can be held in check, if necessary, and then allowed to develop only moderately it becomes productive and profitable. Hence the soil conditions for this variety must be such as to be held in control—making sure that wood growth is not too rapid.

The next variety for our consideration is the Baldwin, which is adapted in general to the northern part of Pennsylvania, along the line with New York. The Baldwin prefers a surface soil ranging from a heavy, fine, sandy loam to a medium mellow loam, with a preference for the latter, while the subsoil should be a mellow medium loam, though it may be a plastic clay loam. But there may be other combinations of soil texture and arrangement which would also be favorable to the Baldwin, and such soils do occur in this State. That is, a soil might contain from 25 to 30 per cent. of clay, provided that the rest of the soil content were largely medium sand instead of silt and very fine sand, as this would give an open texture, whereas if the silt content were high it would be more suitable for the Rhode Island Greening, or Grimes, or Fall Pippin. That is, the Baldwin soil must be moderately porous, and not compact and heavy.

There is one other illustration of the Baldwin adaptation that I would like to call to your attention. The soil for the Baldwin should not be one that produces the most luxuriant growth of forage crops, but rather a moderate growth—a soil upon which some of the lower corn leaves will cure down before time to harvest, and produce a good yield of ear corn, but only a moderate crop of ensilage corn. Note the contrast in this respect with the Rhode Island Greening soil, which should retain the lower corn leaves green until late in the season. Now, this same kind of soil or Baldwin soil, as we go south, is found to be adapted to another variety, the Rome Beauty.

We might pause here to illustrate the relation of soil to climate. In any considerable region we find a given set of climatic conditions —that is, the conditions are variable but they are consistently variable, and in that region certain soils may be adapted to certain varieties of apples or peaches, for instance the adaptation of the Baldwin as already described. But if we go into a different set of climatic conditions, we shall find that a similar character of soil may be adapted to another variety, such as the Rome Beauty, and, in fact, we do find that southwest of here, in West Virginia for example, that we have passed beyond the climatic range best suited to the Baldwin as it becomes a fall apple there, but throughout that general set of climatic factors the Rome Beauty is the variety best adapted to that grade of soil.

Soil for the King should be slightly heavier than for the Baldwin to give a more luxuriant growth of tree and fruit, yet as it is a red apple it must not be planted on too rich ground. Ensilage corn ground is not suitable, and the lighter Baldwin soil is too light. A moderately rapid growth is required both to produce a good tree of this variety and to get fruit of good size, yet the soil must be open enough to avoid the greenish look and undeveloped color brought about by unsuitable soil conditions. Hence, it will be seen that the King is peculiarly exacting in its soil requirements.

We will not take up the variety that prefers the lightest soil we shall consider. The Hubbardston, which succeeds so well in New England and parts of New York and Northern Pennsylvania, grows to perfection on a deep, fine, sandy loam, moderately rich. That is, on a soil a little heavier than a peach soil—if we adopt the soil ideal of the coastal plain region for that fruit. If the soil is too light, the Hubbardston is too small, and if too heavy the fruit does not color as it should and the skins are greasy. Hence, the soil should be very mellow and rather light, yet rich enough to produce a moderately rapid growth. Then it will grow large and also be more resistant to the apple maggot where this pest is troublesome.

A variety which follows closely on the Hubbardston is the Smokehouse—a very popular apple of Pennsylvania. This apple succeeds on the heavier Hubbardston soils and grades over in adaptation upon the lighter Baldwin soils—a very profitable apple in Pennsylvania markets when well grown.

But we sometimes have another problem in soil investigations; a favorite variety of some locality no longer does well, and we often hear that it has "run out," that for some unassignable reason it can no longer be successfully grown. This can be traced in many cases to soil conditions, in that it has been planted on all kinds of soils indiscriminately, and on unfavorable soils the variety not only does not grow well, but is also more susceptible to disease. I have tried to bring out as shown by the work of the Department the adaptation of some particular variety of fruit to each general grade of soil, beginning with the heaviest soils adapted to apple growing and ending with the lightest. These representative grades of soil may be likened to the rungs of a ladder from the bottom to the top, and it is hoped as fast as the work can go on that the individual requirements and preferences of the different varieties of apples and other fruits may be definitely worked out, thereby not only saving enormous sums in the aggregate each year, but also making it possible for the orchardist or farmer, whether large or small, to select the most favorable soils available, and choose the varieties of fruits to which these soils are best adapted, so that all risk of adaptation to orcharding and varieties will be eliminated, thus adding a most important element of insurance to every orcharding project. I have tried not to put the rungs of this ladder so near together that it would be difficult to distinguish the general class of soil which each rung represents. It very often happens, of course, that more than one variety is adapted to one of these general classes, and it also happens that some variety may prefer a kind of soil which represents parts of two grades I have given, but many varieties have a limited range of soil preference which may be defined as a unit.

Other fruits than the apple—particularly the pear and the peach—show decided indications in adaptation for many of the different varieties to special soil conditions, similar to the line of adaptations mentioned for the different varieties of apples. A considerable number of these have already been worked out and investigations are now being carried on whereby it is hoped that the soil adaptations of all the leading varieties of these fruits also may be accurately determined.

PEARS FOR MARKET AND HOME USES.

By Miss Mary M. Haines, *Cheltenham, Pa.*

In looking into the subject assigned to me, I was much interested in some statements made by Mr. A. J. Downing, in his book, "Fruit and Fruit Trees of America," written now 50 years ago. According to Mr. Downing, pears were cultivated in Syria, Greece and Egypt in very ancient times, and were known to the early Romans, but apparently not so favorably known as to the present-day Americans, for one of the early writers says, "All pears whatsoever are but a heavy meat unless they are well boiled or baked." It was left to the seventeenth century to develop the really delicious qualities of the fruit when English and Continental growers vied with each other in their productions. Belgium produced many varieties and is spoken of as the Eden of the pear tree.

Under the more modern cultivators, varieties increased rapidly and we are told that in the middle of the last century "more than 700 kinds, collected from all parts of the world, had been proved in the celebrated experimental garden of the Horticultural Society of London;" of course, many of these were of little or no value and were soon lost sight of. But, from the long list which was left, and which has since been added to, it is difficult to make a selection to suit all tastes. One's early prejudices cannot fail to enter into the choice, and what one person might recommend another would cast aside. Again, many varieties that are excellent for home use would not answer for a commercial orchard, or those grown in one locality very satisfactorily may not succeed at all in another.

In gathering the fruit, especially for home use, it is well to bear in mind the rule that, with few exceptions, pears are much better in flavor and also often more highly colored if picked early and ripened in the house, the time to gather them being indicated by the size and coloring of the fruit and also by the readiness with which the pear separates from its branch when it is gently raised from its hanging position.

When the fruit is gathered it may be spread out on the floor of a cool, dry room or cellar to ripen; certain choice varieties may be laid between the folds of an old blanket while ripening, and both flavor and color will be improved. Winter pears may be wrapped singly in paper or packed in straw and left in boxes till near the time they are wanted, when a few days in a warmer room will improve them. Perhaps no other fruit unless it be peaches is so sensitive to the difference between rough and tender handling, and it makes me shudder to see the way these fruits are sometimes poured from one basket to another, bruising the tender skin and making a center for decay to start. We do not pour eggs from one basket into another—why pears or peaches?

In selecting varieties of pears for market purposes, those which are fine in appearance, and generally the larger the better, and rather firm in texture, will be the most profitable.

Bartlett heads the list, for home or market gardens, and when one says Bartlett no further word of recommendation is needed. The Seckel also needs no introduction, an American variety with an interesting history as related by Mr. Downing, a favorite with every one; this pear especially is improved by the blanket treatment while ripening. Last October, our own pears having gone the way all good pears should go, we purchased some Seckels for the benefit of an English guest; they were procured from a vendor on the street, but were of good size and sound, though unripe and quite hard, and of the usual rustic color; they were placed in a tempered room between folds of flannel and in a few days were ripe and delicious and also finely colored. A late summer pear that sells well to a certain class of purchasers, is fine in appearance and juicy, though rather coarse grained, is the Boussock; if gathered early it ripens slowly and can be marketed during several weeks without any cold storage aid. Probably the pear that has been most planted commercially, especially during the last few years, though one hesitates to mention it here ,is the Kieffer; but it has its friends as well as its foes, and a well-ripened Kieffer pear is by no means to be despised, while for preserving or spicing it stands near the head of the list. The Lawrence is a good pear for market and when well grow and carefully ripened is very satisfactory. But I am sure there are commercial growers here who will want to add other varieties to this list, so I will pass on to the home orchards, which is a more familiar field to me.

Brought up from my earliest childhood with an abundance of pears on our own home grounds, we became acquainted with many varieties which were then popular, among them several kinds which have now been lost sight of and given place to others. One of these lost kinds which is much to be regretted is the Ott, a seedling of the Seckel, small, roundish pear, greenish yellow in color, very sweet, rich and juicy in flavor, ripening in August, a kind that is safe to eat in the dark, leaving only the stem in one's hand for, in handling many bushels I have seldom found an imperfect pear, even though the trees have not been sprayed.

From my own home experience, therefore, if selecting a list of pears, for the home orchard, I would choose in addition to those already named such a variety as would insure a continuous supply. Beginning with Dearborn seedling, a small but sweet and juicy pear, though now rather difficult to find in any nursery, I fear. Madelaine, larger than the former and more tender and juicy and one of the earliest to ripen. Manning's Elizabeth, small to medium, but sweet and good, yellowish in color with red and russet shading towards the blossom end. Koonce, also a very early variety, highly colored and much recommended. Brandywine, a delicious, spicy pear, originating in Chester county. Clapp's Favorite, equal in appearance and almost in flavor to the Bartlett; its chief trouble is its poor keeping properties, for a beautiful exterior may be but a shell concealing a rotten and worthless heart; if gathered at just the right time, however, and carefully handled, it is very good and one season, when Bartletts were scarce, we used Clapp's Favorite for preserving, and I doubt whether many persons would have noticed the difference. The Washington, a stray seedling found in a Delaware hedge row and named in honor of the Father of his country, varies greatly with soil and location, but I have seen them nearly as large as a fair sized Bartlett. rich in flavor and color. Belle Lucrative reminds one of "the little girl who had a curl right in the middle of her forehead, when she was good she was very, very good and when she was bad she was horrid;" they may be delicious and of fine flavor, but they may be absolutely flavorless, hardly even sweet. The Flemish Beauty, as I remember it as a child, was always cracked and imperfect—if one could find a good bite, however. it repaid one for the effort! No doubt, in these days of spraying, this trouble would be overcome, and if so this pear would be a good addition to the family or the market orchard. The Sheldon is a good pear and ripens well; it is fine in flavor and juicy, rather larger than the Buffum though not so fine in grain. Vermont Beauty is one of the newer pears, very attractive in appearance as its name indicates, and of good flavor and keeping qualities. Of all the late pears I think there is none better than the Urbaniste; it ripens on the tree or in the house. I have picked up delicious fruit from the ground quite late in the season; the only trouble being that it is a rather shy and uncertain bearer. Lawrence. we have had until Christmas or later, with no other care than careful handling and packing in straw in the cellar. Winter Nelis is a rough-looking, smallish, brown pear, but juicy and very sweet. The Rutter is rather large and coarse grained, but well flavored and late. For a good late cooking pear the Vicar of Wakefield is considered by some as second to none; it does not ripen until January.

In giving the above list, I have omitted some excellent varieties which it is now difficult to find in nurseries, and others which will no doubt be named in the discussion to follow.

In planting pear trees it is well to remember that a pear tree may last for generations and, its situation should be chosen with this end in view. Mr. Downing mentions several that were known to be near 400 years old. Some varieties of standard pears make large trees. We have a Catherine pear tree that is about sixty years old and is nearly as many feet in height, though this is not an advantage.

The home orchard may return quite a fair profit from the sale of surplus fruit, especially if peaches are scarce, but even for the comfort and pleasure of the family every one should plant pear trees.

In conclusion, let me remind you of the old saying to be observed when eating pears: "Never pare a pear." To all good rules, there are exceptions, but the explanation given for this is reasonable and is that the special flavoring sacs or glands lie very close under the skin and are apt to be removed with the skin, therefore "Never pare a pear."

ADDITIONAL LIST OF GOOD PEARS.

Doyenne D'Eté, ripens middle of July; small, yellow and red.
Lawson, middle of July; large, handsome, good for market.
Osband's Summer, August; medium, yellow, red cheek.
Kirtland, August and September; russet, medium.
Howell, large, yellow; September.

HOME PRESERVATION OF FRUITS.

BY MRS. H. A. SURFACE, *Mechanicsburg, Pa.*

Fruit is generally and erroneously regarded as a luxury, rather than as a valuable and necessary article of food, and many housewives who now stint this supply for economy's sake, would better banish rich pastry from their tables and substitute instead an abundance of fruit.

Acid fruits assist in the digestion and assimilation of carbonaceous foods, and where the diet is largely made up of fats, sweets and starchy foods, unless an abundance of fruit be eaten, or a great deal of out-door exercise taken, headaches and billiousness, neuralgia, rheumatism and kindred disorders result. For persons engaged in sedentary pursuits, fruit is as necessary as bread and meat. It is said that the acid found in most northern fruits stimulates digestion, and is in itself a nerve food. Peaches, plums, apricots and cherries abound in this acid, retaining it in a large degree when dried, and it is found also in almonds, raisins and peach pits. One or two peach pits eaten regularly after meals have been known to cure nervous forms of indigestion. Perhaps in this also lies the secret of the great condimental and food value of almonds.

Nowhere is there greater need of a generous supply of fruit than on the farm, where the diet is apt to be restricted in variety, because of the distance from markets, and no breakfast should be considered complete without fruit. Every farmer should raise a generous supply of the kinds that can be grown in his locality.

In the season when each kind of fruit is plentiful, a generous supply should be canned for the season when both fruits and vegetables are scarce. Plenty of juice from the small, juicy fruits, should be canned for refreshing drinks throughout the year.

If more fruit is raised than the farmily needs, it may be made a source of income by sending the fresh fruit to a nearby market, or by canning, preserving, or making it into jelly. There is magic in the words "Home Made" placed on a label.

The home fruit preserving industry was at its height when it was a serious necessity; from pioneer, or colonial times until about the beginning of the last quarter of the nineteenth century. In those days no home store-room was considered well stocked without its rows of canned and preserved fruits, all carefully labeled, and its scores of glasses of jelly.

During the last quarter of the nineteenth century the decline of this very important home occupation was very rapid, owing:

First. To the great development of the modern commercial spirit in preparing on an expensive scale, and in marketing cheaply, all articles that mankind might need.

Second. To increased facilities for the transportation of fruits, preserved or fresh, especially western and tropical fruits. Ofttimes one could buy canned western peaches much more cheaply than one could buy the materials at home, besides having all the labor of canning to perform.

Third. Increased facilities for the storage of fruits, placing fresh fruits in most of the larger markets at all times of the year.

Fourth. The destruction of most of the home fruit trees by the San José Scale, during the '90's, and more recently.

Fifth. The complexity of our modern social life—bridge-whist. afternoon teas, balls, dinners, embroidery, novels, etc., quite unknown in days of old, have crowded out the more homely duties of the good old grandmother days.

Fortunately, we note a decided tendency toward the increased production of home preserved fruits. This is due to numerous causes. among which may be mentioned:

First. The serious adulteration of commercially prepared fruits.

Second. The very rigid State and National Pure Food Laws, which require all goods to be properly labeled, thus driving from the markets much inferior, adulterated and undesirable material.

Third. Increased demand for home-made foods, due largely to the campaign of Dr. Wiley, Chemist of the United States Department of Agriculture at Washington, showing the deleterious results of consuming adulterated or chemically preserved foods.

Fourth. Higher prices are paid for the home products, now that the adulterated foods are driven out of the market. To illustrate our point, we may pause long enough to say that a few years ago there was an extensive apple jelly factory just across the river from Harrisburg, Pa., and the chief incoming shipments which it received consisted of turnips by the wagon-loads and car-loads. No wonder the industrious and honest housewife, in making and attempting to sell her pure apple jelly could not compete in price with the factory's product.

Fifth. The successful control of the San José Scale. This has been accomplished only within the last five years.

Sixth. The city exodus to small farms, and the enthusiasm of the newly apprenticed farmer's wife in trying her own skill.

Seventh. The recent agricultural and horticultural awakening in our own country, showing that there is real art, science and brains needed, rather than mere routine drudgery. Among these factors are agricultural and horticultural societies, granges, farmers' clubs. farmers' institutes, State and National bulletins, State experiment stations, and, perhaps, above all, the State agricultural colleges, with their universal cry of "back to the soil" with "practical science."

The history of the rise and fall of the home preservation of fruits, and, later, of the tendency to again increase in our own country, closely follows that of the Old Country. In England to-day there is a decided tendency toward the revival of this very important home industry.

Vicar W. Wilks, the Honorable Secretary of the Royal Horticultural Society of England, and Vicar of Shirley, last June wrote as follows, in the "Introduction" to "The Book of Fruit Bottling," by Edith Bradley and May Cooke (John Lane Company, New York, Publishers): "Well, I have seen the art (of the home preservation of fruits) as practiced in our country die out amongst us—the lowest depths being reached about 1885, when I doubt whether there were a dozen ladies in the land who did their own bottling and preserving. Of late years that has revived somewhat, owing chiefly, I think, to the influence of the Royal Horticultural Society among public bodies."

Fruits are ordinarily preserved, or kept for home use in four ways: First, by canning; second, by preserving; third, by making into jams and jellies, and fourth, by drying.

In the preservation of foods by canning, preserving, etc., the most essential processes are the thorough sterilization of the food, and all the utensils, and sealing the sterilized food to exclude all air that might contain germs to re-infect it.

A few words concerning methods may be helpful. In preserving, canning or jelly-making, iron or tin utensils should never be used. Use only porcelain-lined, enameled, brass, copper or aluminum cooking utensils. For paring fruits a silver or plated knife should be used, to avoid the discoloration of the fruit. It is well to remember that results are more satisfactory if fruit be heated to the boiling point gradually, and then cooked the required time.

The selection of fruit is one of the first steps in obtaining successful results. Fruit is at its best for all purposes, just before it is perfectly ripe. All soft fruits ferment very rapidly if over-ripe. Most fruits should be freshly picked, and all should be kept dry. In selecting small-seeded fruits it is not wise to select those which have a large proportion of seeds to pulp, unless the seeds be removed by straining or otherwise.

In preparing apples, quinces or pears, the fruit, after peeling and coring, should be dropped at once into cold water, to which a few drops of lemon juice have been added, to keep the fruit white. Use the juice of one lemon in two quarts of water, or add salt to cold water, an ounce of salt in a gallon of water.

If berries must be mashed, it is best to put a small quantity at a time in a colander, pour over them cold water, then put it on a sieve to drain, but it is better to keep them clean and dry from the time of picking.

The easiest and quickest way to peel peaches is to fill a wire frying basket with the fruit, plunge it into boiling water for three minutes then remove and plunge for a moment into cold water, when the skins will slip off easily. Plums and tomatoes may be prepared in the same way.

MAKING SYRUP.

Syrups are of two degrees, heavy and light, according to the proportion of sugar and water used. The following table will give fairly accurately the percentage of sugar when the syrup has been boiling one minute, also which density is best for the various kinds of fruit:

1 pint of sugar, 1 gill water = 40 degrees density, for preserved strawberries and cherries.

1 pint of sugar, ½ pint water, . .
1 pint sugar, 3 gills water, ... } Peaches, plums, quinces, currants.

1 pint sugar, 1 pint water—use for all canned acid fruits, such as early plums and sour cherries.

1 pint sugar, 1½ pints water, . .
1 pint sugar, 2 pints water, . . . } Light syrup for canned pears, peaches, sweet plums, sweet cherries, raspberries, blueberries and blackberries.

A syrup gauge is a graduated glass tube, which registers from 0° to 50°, and is employed to determine the quantity of sugar in the syrup.

In making syrups, the sugar should be dissolved in the water before it is heated. Heat slowly and boil gently without stirring; if rich syrups are boiled hard or jarred, there is danger of crystallization. Syrups may be made a day in advance of the regular canning.

CANNING FRUITS.

Most fruits should be canned rather than preserved. Everything must be carefully sterilized, and rubber rings should be renewed each year. Use the best jars obtainable. Keep abreast of the times. and watch for anything new that may come upon the market. The perfect jar has not yet appeared, but the Schram jar, made in St. Louis, is the most satisfactory jar found as yet by the writer. Wide-mouthed jars for large fruits, canned whole, permit better show. A very successful way to can strawberries, cherries, or any of the thin skinned fruits is as follows: Have jars hot; pack closely with the uncooked fruit; fill with boiling syrup (one pint sugar to one gill water; seal. Have ready a wash-boiler of boiling water. Place jars in this, tops down, having the jars completely submerged. Put the boiler away in any convenient and safe place until the water is cold. Fruit canned in this way retains its color and shape beautifully. Personally, for additional safety, I nearly always dip the tops of cans into melted paraffine, deep enough to come below the rubbers. after the cans are cold.

Fruit may be canned by simply stewing the fruit, placing it while boiling hot in the hot, sterilized jars; run the blade of a sterilized silver knife around, inside of the jar, that the fruit may be packed more solidly. Wipe the rim of the jar, dip the rubber ring into boiling water, place smoothly on the jar and seal. The work of filling must be done rapidly; each jar must be sealed as soon as filled, and the jars must be placed on a board out of a draft of cold air. If screw tops are used, they must be tightened after cooling.

CANNING IN THE OVEN.

This is an excellent method, all danger from scorching or burning being avoided. Cover the bottom of the oven with a sheet of asbestos, or place the fruit in shallow pans containing about two inches of boiling water. Sterilize; prepare fruit and syrup as previously directed. Fill the hot jars with fruit and syrup and place in the moderately hot oven. Cook ten minutes (a little longer for pears and quinces), remove from the oven; fill to overflowing with hot syrup and seal. Large fruits require about one pint syrup to each quart jar; small fruits about half a pint of syrup.

CANNED FRUIT IN WATER BATH.

Prepare fruit and syrup as for cooking in oven. Fill the sterilized jars and put on covers loosely. Place a wooden rack on bottom of boiler. Put in enough warm water to come about four inches above the rack. Place the jars in boiler, and be careful not to let them touch each other. Cover boiler and cook for ten minutes. Draw back on the stove, and when the steam passes of, remove each can to a pan of hot water; fill with boiling syrup and seal. (I have varied this method by putting covers on tightly, filling the boiler full enough so that the water covers up just to the rubber ring. This does away with exposing the contents to the air even for one moment,) after cooking.

Rhubarb may be canned by cold process in this way; cut rhubarb when young and tender; wash thoroughly and pare; cut in pieces about two inches long. Pack in sterilized jars; fill to overflowing with cold water and let stand ten minutes; drain and fill again; seal with sterilized rings and covers. Gooseberries may be canned in the same manner.

PRESERVING FRUITS.

Some fruits are good only when preserved. Strawberries, sour cherries, sour plums and quinces belong to this class. In preserving, if one wishes to keep the preserves in jars or glasses, equal weights of sugar and fruit should be used.

For strawberries, currants, cherries, etc., use equal weights of fruit and sugar. Place a layer of fruit, then a layer of sugar in a kettle to a depth of about four inches. Heat slowly to draw out the juice; when it begins to boil, skim and boil for ten minutes. Pour the cooked fruit into platters, having it about two inches deep; place in a sunny window for four days. The fruit will grow plump and firm, and the syrup will thicken into jelly.

Also preserve by immersing the fruit in honey.

JELLY MAKING.

It has been demonstrated that when sugar is dissolved and heated in fruit juice, of the syrup gauge registers 25 degrees, the proportion of sugar is exactly right for combining with the pectin bodies to make jelly. If the gauge register more than 25 degrees add more juice; if less, add more sugar.

One source of trouble in jelly making is too rapid boiling. Another source is an incorrect proportion of sugar. It is not generally known, perhaps, that fruit ripened in a hot season with plenty of sunshine, contains a greater proportion of sugar, than that ripened in cold, damp weather, hence one may use one pint of sugar to one of fruit juice one season, and the next year use one pint of the same kind of juice to three-quarters of a pint of sugar. A syrup gauge is invaluable here, for if it registers 25 degrees your jelly will be just right. The general method of making jelly is too well known to take time to describe here. The jelly should be placed in the sun to "set," and then covered with a disc of paper dipped in parafine.

Currant jelly may be made by the cold process, and is more delicate than when boiled, but does not keep as well. To make: measure the juice, and take for every pint of juice one pint granulated sugar. Dissolve thoroughly the sugar in the juice. Fill hot, sterilized glasses with this, and place the glasses on a board in a sunny window. Cover the glasses with glass, and leave in the sunny window until set.

Many persons use parings and cores of fruit in jelly making. I am not sure that this is always wise or economical.

FRUIT JUICES.

Sweet grape juice is particularly good as a drink. The juice should be pressed from the grapes, sterilized, and placed in sterilized bottles, using one gill water to one quart juice. Raspberry, blackberry, strawberry and currant juices are made in the same way, using half a pint of sugar to a quart of juice, and in currants a pint of sugar to a quart of juice.

Cider.—To make good cider it is necessary to have the best kinds of good fruit, and this is not always easy, because the culture of the cider apple has been neglected of late. Most delicious ciders may be made from crab apples. In England, cider is made from a wild crab apple, which is too puckery and unpleasant to use otherwise, but the juice is delicious and is often sold as champagne. It is not necessary to say that all refuse and dirt should be carefully guarded against in making cider.

Perry is the expressed juice of the pear, and is not often made in this country, pears being too expensive and rare.

CANNING VEGETABLES.

Lima beans and string beans should be slightly boiled, not cooked. in clear water, and this water poured off. One will find the water which is poured off quite green. Have the jars hot, pack as full as possible, with the beans; fill to overflowing with boiling water and seal. Place in a wash boiler, fill with cold water up to the rubbers and boil for three hours. Take cans out and tighten tops. In some cases the rubbers will have pushed out in such a way as to render a new rubber necessary. If after cooking the liquid does not cover the beans, it is well to fill the can again with boiling water.

Corn is canned in exactly the same way, except that it is not boiled first, but jacked into jars cold. In using these vegetables, let cold water run over them in the can for a few moments before taking out. Tomatoes may be successfully canned in the same manner. (See sample).

DRYING FRUITS.

In preparing a supply of fruit for winter use, every thrifty housewife prepares a quantity of dried fruits. Drying is much less expensive than canning or preserving, and many people prefer the flavor of a dried peach to that of the finest canned fruit. A hot bed frame with a bottom to it, and slightly raised from the ground, makes an excellent drying box. The sash should be elevated at one end to allow the moisture to run off, and the opening covered with netting. Fruit may be placed on plates and dried in the oven, but much care must be taken to prevent scorching. Numerous cook stove dryers have been placed upon the market, some of which are very excellent.

The secret of keeping dried fruit is to exclude the light, and keep in a cool, dry place. It is said that dried fruit put away with a little sassafras bark will keep for years unmolested by insects. All fruit is better peeled before drying. Apples, bananas, blackberries, cherries, currants, gooseberries, green gages, peaches, pineapple, prunes, in fact almost all fruits may be dried in times of plenty, and stored for the time when the crop fails.

The Maiden Blush apple is considered best for drying.

TABLE.

(Varies with the state of maturity of the fruit or vegetable.)

1 bushel apples gives 6½ pounds dried fruit.
1 bushel peaches gives 7 pounds dried fruit.
1 bushel of peaches, unpared, gives 9 to 10 pounds dried fruit.
1 bushel pears gives 6 to 8 pounds dried fruit.
1 bushel apricots, 8 pounds.
1 bushel of plums, pitted, 9 to 10 pounds.
100 quarts raspberries, 32 to 35 pounds.
100 quarts blackberries, 35 pounds.
100 quarts cherries (stoned), 25 pounds.
100 quarts of blueberries, 26 pounds.
100 pounds sweet corn, 26 pounds.
100 pounds pumpkin, 9 pounds.

SOME UNUSUAL RECIPES.

1. Cherry Salad: Use the large white cherries. Remove the pits, replace with filberts, and serve in a bed of lettuce leaves, covering the whole with mayonaise.

2. The juice of canned blackberries or cherry preserves, or the juice that is left from stewed prunes, may be cooked with stewed apples, or put into a rice or bread pudding, and will impart a delicious flavor.

3. Tomato Rarebit: ½ can tomatoes, ¼ of an onion, 3 cloves, 1-3 teaspoon mustard, ½ teaspoon salt, ¼ teaspoon soda. Cook ten minutes; add ½ teaspoon cornstarch and strain; add 6 ounces grated cheese, and when melted serve on toast or hot crackers.

4. Watermelon Rind: Cut melon rind as for preserves, leaving the meat in large square pieces; boil one hour in water. Drain and boil again, with an equal weight of sugar until boiled down thick. Dry on plates, and use in cakes and mincemeat in place of citron.

5. Pear Salad: Serve on a lettuce leaf half of a canned pear, and cover with a boiled cream dressing and chopped nuts.

6. Carrot Preserve: Boil small, fine-grained carrots in water until tender. Peel and grate. Add sugar to taste, slips of citron, spices to taste, a little orange and lemon juice, half and half, simmer slowly and put away in jars. Very wholesome for children.

7. Rowan of Mountain-ash berries make excellent jelly, and are also valuable for sore throat. Pick berries when red, but not too ripe. Strip berries from stem, and put into a kettle. Add enough cold water to cover berries. Cook until soft, and strain through jelly bag. To every cup of juice add one cup granulated sugar and cook until it jellies.

Rhubarb or pie plant can be mixed with any kind of fruit, half and half, and in a short time will taste exactly like the fruit with which it is mixed.

RHUBARB PRESERVE.

5 pounds rhubarb, 5 pounds sugar, 1 pound raisins, 2 oranges, sliced, without peeling. Cook thick, stirring almost constantly. This is very nice, and cooks very rapidly.

In closing, I would suggest for our own region, the following varieties of fruits as especially adapted to various uses:

Apples, for drying, Maiden Blush, because white.

Pears, for canning, Bartlett and Duchess. The Duchess and Keiffer pears are very much improved by canning.

Plums, to can, Damson.

Cherries, to can, the Ida, originated by Mr. Eli Cocklin, at Bowmansdale; also the Cumberland.

Currants, to can and dry, black.

Currants, for jelly, red, or white, when ripe.

Preserving, in any form, is to be recommended as an economical method of disposing of second grade fruits. Any one who can produce fruits of first or fancy grade, can sell them. The great problem of our producers will be to make profits on their second grades. For this we recommend commercial home canning or preserving, or the establishment of local canneries, perhaps on the co-operative plan.

SOME SPRAYING EXPERIMENTS.

By J. E. Heine, *Orwigsburg, Pa.*

I don't know whether I am qualified to speak on this subject or not. I am not an expert. Some claim I am a fruit grower, and I would like to be, but only grow it on a small scale. That is the reason I am here, and as I look over the faces of this audience, I am not sure that I am even a fruit grower. I have about fifteen hundred trees. I would have planted more, but for lack of funds. Most of these trees have been planted within the last four or five years.

The most important point I would like to take up with you this afternoon is the matter of scale. Not being well supplied with funds. the scale question is a very important one to me. Just at the time I thought the lime and sulphur wash was the standard remedy for the scale, Mr. Atkinson somes out in his November number of the Farm Journal, with very discouraging news. I wrote to him for further information, and he gave me information that was still more discouraging. He believes that lime and sulphur is injurious to fruit trees. Then I wrote letters to a number of New York fruit growers, requesting their replies. Most of them recommended lime and sulphur. Some of them recommended the oils. Now, it appears to me, so far, that oil is too expensive, and it is not a fungicide, while the lime and sulphur is, in a certain measure, and it is still more dangerous to handle. I hardly know what to do. I have not used lime and sulphur since Mr. Atkinson says it is injurious to the tree, as he certainly ought to know what he is talking about. Five years ago I was in his orchard, and saw his trees, and he certainly had fine trees and fine fruit. This year he claims he has very little fruit, and he has Italians at work in his orchard with grubbing hoes, digging up the trees, because they have been ruined.

Now, I would like to have those of you who have had considerable experience in spraying, to help me out on this question, as to what is really the best and cheapest remedy for the San José Scale. I believe we are getting to the point where we will have to have a cheaper remedy than these present oils. So far I have been able to control the scale with lime and sulphur, wherever I have sprayed. Of course, where I have not sprayed thoroughly, the scale continues.

Up in our section, most men know very little about the scale. We do not know the history of the San José of Oyster Shell Scale, or how to control them, and unless we find some remedy that will not injure the trees, we will have to discontinue fruit growing. If a man wants to raise fruit now-a-days, he must use some good scalecide, and pay more attention to the work, or do what our people up in Schuylkill county are doing—go out of the business.

It has been claimed that it is much cheaper to fight fungus by painting with whitelead and oil, than to fight it with copper sulphate. The copper sulphate is better, but quite expensive if one wants to spray thoroughly. A good many people have too weak a pump. A weak pump cannot do proper work; I believe in having lots of pressure. A barrel pump is rather small for me, and I don't care much for them. There should be at least a hundred and thirty to a hundred and fifty pounds pressure to throw the spray to any height. He should make two sprayings, one in the spring, and one in the fall, and spray the tree thoroughly on all sides. I have tried many different nozzles, and have come to the conclusion that the Grant nozzle is the best for my purpose that I have ever used. It is not a nozzle for a low pressure pump, but it responds easily to high pressure. It is much better than the Single Vermorel. I have also used the Double Vermorel. It controls the pressure easily.

HOME-MADE SOLUBLE OILS.

BY PROF. H. A. SURFACE, *Economic Zoologist, Harrisburg, Pa.*

Concerning this subject of Mr. Atkinson's orchard over near Ambler, I want to say that although he made the statement that the lime and sulphur wash had failed to control the scale, I have hundreds of letters from all over the State, saying that lime and sulphur is absolutely the best remedy to free trees from scale. After he made that statement, I went to see him about it, and he practically gave me a conference during most of the afternoon, and he finally said that he probably made his statement too strong; the men who were sent out to spray his orchard did not do the work properly; only one side of the tree was sprayed, and they really did not spray at all, only put a little of the mixture on the trees. He told me that while he considered his orchard had not been saved by the one application of lime and sulphur wash, had he published what he knew of the use of commercial oils, it would have been five times worse, as his trees (especially pear) were at one time stunted and absolutely permanently ruined by the use of oils.

Now, I am to talk to you on the subject of "Home-Made Soluble Oils," but I am in a position where I can yet scarcely speak positively on the subject from personal experience, and don't wish to mislead any one. There are two bulletins on this subject, one published in Delaware, and one in Connecticut. The Experiment Station at Storrs, Conn., published a bulletin on this, after experimenting in this direction, but what I am going to say to you is based on our experiments by one of my assistants, Mr. F. L. Hartzell, who has experimented with the making and use of this material, and on what I have learned by studying the subject.

So far as we know now, many of the so-called "soluble oils" put on the market under various high-sounding names can be made at home at less than one-half the cost you can buy them in any case offered, and there is less of the danger element. The danger with most of these commercial oils is that if they are strong enough to do the work of killing the San José Scale they are liable to damage the tree, and again, these oils are not fungicides. Then, again, there is the high price. Now, some of the chemists and entomologists of the different states decided to see whether they could not make a soluble oil that would be cheaper and better, and between them the following formula has been prepared.

You make first the emulsifier. Oil treated with this emulsifier has the advantage over the crude petroleum alone in that when we are going to use it we can dilute it with water to the amount we want to put on the tree. First, let me state to my correspondents that I am going to work this out myself, and publish it in my Bulletin, so they need not take only my present word for it; now, this is the **emulsifier:**

Carbolic acid (100 per cent), 2 quarts.
Good fish oil, either whale or Menhaden, 2½ quarts.
Caustic potash, pure granulated 75 per cent., 1 pound.

Heat these in a covered kettle, in the open air, to 300 degrees Fahrenheit. That takes a very few minutes to do this—possibly fifteen minutes. Then we let it cool and add 3½ quarts of kerosene, and 5½ gallons of water. That is the emulsifier. Instead of remov- it from the fire, we can simply bank the fire to add the kerosene. It is not advisable to add it while over the blazing fire. Then we make the soluble oil; this is made as follows:

Emulsifier, 8 parts.
Crude oil, 4 parts (Warren sand oil will do).
Resin oil, 4 parts.
Water, 1 part.

This costs from 16 to 18 cents a gallon, and in applying it you take one part to 16 gallons of water; so it makes the material cost you about one cent per gallon as it goes on the trees. This cost is figured in this way:

Carbolic acid, 52 cents.
Fish oil, 15 cents a gallon.
Caustic soda, 15 cents a pound.
Kerosene, 9 cents per gallon, by the barrel.
Resin oil, 30 cents a gallon.

This does not take as long to prepare as the lime and sulphur, but we must remember that it is not a fungicide, while the lime and sulphur is. There is no reason to suppose that this is injurious, as is the case with the majority of oils, and it has the advantage, in common, with the lime and sulphur, of destroying the scale.

I have letters from hundreds and hundreds of people who have saved their trees by the use of lime and sulphur, and on the other hand, I have letters from others who have destroyed their orchards by the use of some of these commercial oils that are on the market. Take the case of one material that is on the market, called the "Target Brand Scale Destroyer." At present, it appears to have a good hold on the market, and yet I know of a case where a man had thirty-five hundred trees and killed four hundred of them by its use,—some of his very best trees, and I can name instances of other people who have lost their trees.

Now, as long as we continue to use such commercial preparations, and to encourage their manufacture, we cannot hope to get the results in our orchards that we want.

DEMONSTRATION ORCHARDS.

BY PROF. H. A. SURFACE.

The chief new feature of the work of the Economic Zoologist for the year 1908 is to be the establishment of a number of demonstration orchards in the State of Pennsylvania. The purpose of undertaking this work is to show in a practical way just how to control orchard pests, both insects and diseases, and to produce perfect fruit at the lowest cost, by known and tested methods. Experiments are being conducted from our own office in the vicinity of Harrisburg and Mechanicsburg with new methods, or materials to obtain new results, and it is not advisable to attempt any real experiments in these demonstration orchards, but to show the public what can be done in a practical way. There is a great deal of difference between experiments and demonstrations. In the former the person undertakes work by some new method, with new apparatus, or with new materials, at a new or unusual time, etc., to learn what results may follow. The results are unknown at the time of performing the work. and may not prove beneficial in the end. However, where beneficial results are obtained they are of course new, and may often be very useful, but should be tried again before being placed before the public. The experiments which we have performed up to the present time have been of a wide range, including all kinds of insecticides and fungicides available, different kinds of apparatus, treatment of infested trees and plants by a great variety of means and at different times of the year. The results of these have been published from time to time in our bulletins and will continue to be so published in the future.

A demonstration is for the purpose of showing the public the methods of some work which is already known and understood by the demonstrator, and consequently the result of which can not be in doubt. Thus, the demonstration orchard work in this State is to be for the purpose of obtaining definite results which we now know must follow certain methods, and especially for the purpose of showing the public how the work is done to obtain these results. Therefore, the orchards must be so situated that they will be available to the greatest number of persons in a county or region, and should be of sufficient size to be suitable in fairly demonstrating horticultural methods, including pruning, spraying, thinning of fruit and possibly also cultivating and fertilizing, with special reference to the known modern methods of controlling insects and preventing plant disease. Everything that can be done to increase or promote the vigor of a tree is quite advisable as aids in helping to overcome the adverse effects of injuries by injurious diseases, insects, or other causes. Thus, the cultivation and fertilization of an orchard to promote proper growth are necessary parts of insecticidal practice, and pruning is so intimately connected with spraying that one can not do a proper spraying job without first properly pruning his trees. Also, if the trees be permitted to bear twice the amount of fruit they should, and weaken themselves, they are at once more susceptible to injury by diseases and insects, and consequently the thinning of fruit must receive its proper attention at the right time.

It is our present intention to accept in each of the fruit-growing counties of the State an orchard that is easy of access to the public, containing some bearing trees of different kinds, preferring apple, pear, peach, plum and others if possible, some of which should be of bearing age, although the others may be younger, but all should not be of the old style high-headed varieties, which it is almost impossible to treat properly by modern methods. We are willing to take a few such trees and show how to prune and spray them and give them proper treatment throughout the year, but we shall not assume the most difficult and in many cases impossible task of the horticulturist in attempting to renovate or restore an old worn-out orchard of very tall, badly infested trees. In such cases it would be cheaper and much more advisable to remove the old trees and plant new ones.

We shall also demonstrate the planting and care of some young orchards from the preparation of the soil, the selection of varieties, setting and pruning the trees, and care in their later development as long as the demonstrations are continued.

It is our purpose to have charge of these demonstration orchards throughout the entire year and continue the demonstrations during next year and doubtless as long as legislative provision be made for this kind of work. The longer the demonstration orchard is continued as such the more profitable to the community it should become. In consideration of the fact that in many parts of the State this will be "off year" in apple production, it is not to be expected that a demonstration orchard can by any manipulation given it at present, be made to bear as much fruit as it did last year, which was the season for a full crop. However, we hope in these orchards to demonstrate means of aiding to reduce excessive production every other year and increase the fruit crop in alternate years, when locally it would be more valuable.

The details of the requirements of the orchardist or owner are not yet settled, but the probable offer from this office will be to furnish all spraying materials needed, and also apparatus if the owner does not have an outfit, and send an expert to assume intelligent control of the orchard methods and direct the work and assist with it. Our representative will render service in the orchard without charge to the owner further than his own board and lodging where he is not near a hotel, and the owner will be permitted to make such use of the fruit as he may desire after our superintendent has had opportunity to make notes and measurements of yield.

This is an opportunity to obtain intelligent guidance in modern methods of orchard culture without expense to the owner or community, and should result very beneficially in those regions where there is no expert orchardist immediately available for observation and consultation. Where there is an expert in orcharding, there is no need of establishing a demonstration orchard, for the reason that ours would probably not differ greatly from his, and he would no doubt be willing to permit persons to see his methods if they should so desire. In other words, we propose a campaign of education, and upon the principle that it is not necessary to teach rudiments to persons who are already educated, it may not be found most profitable to establish demonstration orchards at the premises of expert and successful fruit growers.

Inspectors will be sent to investigate conditions in orchards offered for this work, and will make a report to us concerning the availability of the orchard, number and kinds of trees, etc., there grown, their age and condition, and other data, that will help in arriving at a decision in making a selection of the orchard for demonstration purposes. After such selection is made notification will be given through these bulletins, the newspapers and by other means, and an especial effort will be made to invite the public to visit the orchards. The public should see the method of planting, pruning, spraying for scale, spraying for the codling moth, spraying for leaf diseases and diseases of fruit, thinning, picking and other work that will be announced later. It is to be hoped that many persons will be ready to avail themselves of this opportunity to receive direct practical instruction.

APPENDIX.

APPENDIX.

LIST OF PUBLICATIONS OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

ANNUAL REPORTS.

*Report of the State Board of Agriculture, 336 pages, 1877.
*Report of the State Board of Agriculture, 625 pages, 1878.
*Report of the State Board of Agriculture, 560 pages, 1879.
*Report of the State Board of Agriculture, 557 pages, 1880.
*Report of the State Board of Agriculture, 646 pages, 1881.
*Report of the State Board of Agriculture, 645 pages, 1882.
*Report of the State Board of Agriculture, 645 pages, 1883.
*Report of the State Board of Agriculture, 648 pages, 1884.
*Report of the State Board of Agriculture, 645 pages, 1885.
*Report of the State Board of Agriculture, 646 pages, 1886.
*Report of the State Board of Agriculture, 650 pages, 1887.
*Report of the State Board of Agriculture, 648 pages, 1888.
*Report of the State Board of Agriculture, 650 pages, 1889.
*Report of the State Board of Agriculture, 594 pages, 1890.
*Report of the State Board of Agriculture, 600 pages, 1891.
*Report of the State Board of Agriculture, 640 pages, 1892.
*Report of the State Board of Agriculture, 713 pages, 1893.
*Report of the State Board of Agriculture, 646 pages, 1894.
*Report of the Department of Agriculture, 878 pages, 1895.
*Report of the Department of Agriculture, Part 1, 820 pages, 1896.
*Report of the Department of Agriculture, Part 2, 444 pages, 1896.
*Report of the Department of Agriculture, Part 1, 897 pages, 1897.
*Report of the Department of Agriculture, Part 2, 309 pages, 1897.
*Report of the Department of Agriculture, 894 pages, 1898.
*Report of the Department of Agriculture, Part 1, 1082 pages, 1899.
*Report of the Department of Agriculture, Part 2, 368 pages, 1899.
*Report of the Department of Agriculture, Part 1, 1010 pages, 1900.
*Report of the Department of Agriculture, Part 2, 348 pages, 1900.
*Report of the Department of Agriculture, Part 1, 1040 pages, 1901.
*Report of the Department of Agriculture, Part 2, 464 pages, 1901.
*Report of the Department of Agriculture, Part 1, 1030 pages, 1903.
*Report of the Department of Agriculture, Part 2, 324 pages, 1902.
*Report of the Department of Agriculture, 958 pages, 1903.
*Report of the Department of Agriculture, 790 pages, 1904.
Report of the Department of Agriculture, 846 pages, 1905.
Report of the Department of Agriculture, 690 pages, 1906.
Report of the Department of Agriculture, 565 pages, 1907.

BULLETINS.

No. 1.*Tabulated Analyses of Commercial Fertilizers, 24 pages, 1895.
No. 2.*List of Lecturers of Farmers' Institutes, 36 pages, 1895.
No. 3.* The Pure Food Question in Pennsylvania, 38 pages, 1895.
No. 4.* Tabulated Analyses of Commercial Fertilizers, 22 pages, 1896.
No. 5.* Tabulated Analyses of Commercial Fertilizers, 38 pages, 1896.
No. 6.* Taxidermy; how to collect Skins, etc., 128 pages, 1896.
No. 7.* List of Creameries in Pennsylvania, 68 pages, 1896.
No. 8.* Report of State Horticultural Association, 108 pages, 1896.
No. 9.* Report of Dairymen's Association, 96 pages, 1896.
No. 10.* Prepared Food for Invalids and Infants, 12 pages, 1896.

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*Note.—Edition exhausted.

No. 11.* Tabulated Analyses of Commercial Fertilizers, 22 pages, 1896.
No. 12.* Road Laws for Pennsylvania, 42 pages, 1896.
No. 13.* Report of Butter Colors, 8 pages, 1896.
No. 14.* Farmers' Institutes in Pennsylvania, 92 pages, 1896.
No. 15.* Good Roads for Pennsylvania, 42 pages, 1896.
No. 16.* Dairy Feeding as Practiced in Pennsylvania, 126 pages, 1896.
No. 17.* Diseases and Enemies of Poultry, 128 pages, 1896.
No. 18.* Digest of the General and Special Road Laws for Pennsylvania, 130 pages, 1896.
No. 19.* Tabulated Analyses of Commercial Fertilizers, 40 pages, 1896.
No. 20.* Preliminary Report of Secretary, 126 pages, 1896.
No. 21.* The Township High School, 24 pages, 1897.
No. 22.* Cider Vinegar of Pennsylvania, 28 pages, 1897.
No. 23.* Tabulated Analyses of Commercial Fertilizers, 31 pages, 1897.
No. 24.* Pure Food and Dairy Laws of Pennsylvania, 19 pages, 1897.
No. 25.* Farmers' Institutes in Pennsylvania, 8 pages, 1897.
No. 26.* Farmers Institutes in Pennsylvania, 74 pages, 1897.
No. 27.* The Cultivation of American Ginseng, 23 pages, 1897.
No. 28.* The Fungous Foes of the Farmer, 19 pages, 1897.
No. 29.* Investigations in the Bark of Trees, 17 pages, 1897.
No. 30.* Sex in Plants, 17 pages, 1897.
No. 31.* The Economic Side of the Mole, 42 pages, 1898.
No. 32.* Pure Food and Dairy Laws, 30 pages, 1898.
No. 33.* Tabulated Analyses of Commercial Fertilizers, 42 pages, 1898.
No. 34.* Preliminary Report of the Secretary, 150 pages, 1898.
No. 35.* Veterinary Medicines, 23 pages, 1898.
No. 36.* Constitutions and By-Laws, 73 pages, 1898.
No. 37.* Tabulated Analyses of Commercial Fertilizers, 40 pages, 1898.
No. 38.* Farmers' Institutes in Pennsylvania, 8 pages, 1898.
No. 39.* Farmers' Institutes in Pennsylvania, 88 pages, 1898.
No. 40.* Questions and Answers, 206 pages, 1898.
No. 41.* Preliminary Reports of the Department, 189 pages, 1899
No. 42.* List of Creameries in Pennsylvania, 88 pages, 1899.
No. 43.* The San José and other Scale Insects, 22 pages, 1899.
No. 44.* Tabulated Analyses of Commercial Fertilizers, 62 pages, 1899.
No. 45.* Some Harmful Household Insects, 13 pages, 1899.
No. 46.* Some Insects Injurious to Wheat, 24 pages, 1899.
No. 47.* Some Insects Attacking Fruit, etc., 19 pages, 1899.
No. 48.* Common Cabbage Insects, 14 pages, 1899
No. 49.* Methods of Protecting Crops, etc., 20 pages, 1899.
No. 50.* Pure Food and Dairy Laws of Pennsylvania, 33 pages, 1899
No. 51.* Tabulated Analyses of Commercial Fertilizers, 69 pages, 1899.
No. 52.* Proceedings Spring Meeting of Round-up Meeting, Farmers' Institute Managers, etc., 296 pages, 1899.
No. 53.* Farmers' Institutes in Pennsylvania, 1899-1900, 94 pages, 1899.
No. 54.* Tabulated Analyses of Commercial Fertilizers, 163 pages, 1899.
No. 55.* The Composition and Use of Fertilizers, 126 pages, 1899.
No. 56. Nursery Fumigation and the Construction and Management of the Fumigating House, 24 pages, 1899.
No. 57. The Application of Acetylene Illumination to Country Homes, 85 pages, 1899.
No. 58. The Chemical study of the Apple and Its Products, 44 pages, 1899.
No. 59. Fungous Foes of Vegetable Fruits, 39 pages, 1899.
No. 60.* List of Creameries in Pennsylvania, 33 pages, 1899.
No. 61.* The Use of Lime in Pennsylvania Soils, 170 pages, 1900
No. 62.* A Summer's Work Abroad in School Grounds, Home Grounds, Play Grounds, Parks and Forests, 34 pages, 1900.
No. 63.* A Course in Nature Study for Use in the Public Schools, 119 pages, 1900.
No. 64.* Nature Study Reference Library for Use in the Public Schools, 22 pages, 1900.
No. 65.* Farmers' Library List, 29 pages, 1900.
No. 66.* Pennsylvania Road Statistics, 98 pages, 1900.
No. 67. Methods of Steer Feeding, 14 pages, 1900.
No. 68.* Farmers' Institutes in Pennsylvania, 90 pages, 1900.
No. 69.* Road Making Materials of Pennsylvania, 104 pages, 1900.
No. 70.* Tabulated Analyses of Commercial Fertilizers, 97 pages, 1900.
No. 71. Consolidation of Country Schools and the Transportation of Scholars by Use of Vans, 89 pages, 1900.
No. 72.* Tabulated Analyses of Commercial Fertilizers, 170 pages, 1900.
No. 73. Synopsis of the Tax Laws of Pennsylvania, 132 pages, 1901.
No. 74.* The Repression of Tuberculosis of Cattle by Sanitation, 24 pages, 1901.
No. 75.* Tuberculosis of Cattle. and the Pennsylvania Plan for its Repression, 263 pages, 1901.

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*Note.—Edition exhausted.

No. 76. A Co-operative Investigation into the Agricultural Seed Supply of Pennsylvania, 50 pages, 1901.

No. 77.* Bee Culture, 101 pages, 1901.

No. 78.* List of County and Local Agricultural Societies, 10 pages, 1901.

No. 79. Rabies, 28 pages, 1901.

No. 80.* Decisions of the Department of Agriculture on the Pure Food Act of 1895, 20 pages, 1901.

No. 81. *Concentrated Commercial Feeding Stuffs in Pennsylvania, 136 pages, 1901.

No. 82.* Containing the Law Creating a Department of Agriculture in Pennsylvania, and giving the Various Acts of Assembly Committed to the Department for Enforcement; Together with Decisions and Standards Adopted with Reference to the Pure Food Act of 1895, 90 pages, 1901

No. 83.* Tabulated Analyses of Commercial Fertilizers, 132 pages, 1901.

No. 84. Methods of Steer Feeding; the Second Year of Co-operative Experiment by the Pennsylvania State Department of Agriculture and the Pennsylvania State College Agricultural Experiment Station, 16 pages, 1901.

No. 85.* Farmers' Institutes of Pennsylvania, 102 pages, 1901

No. 86.* Containing a Complete List of Licenses granted by the Dairy and Food Commisisoner, from January 1, 1901, to July 1, 1901, etc., 422 pages, 1901.

No. 87.* Giving Average Composition of Feeding Stuffs, 42 pages, 1901.

No. 88.* List of Creameries in Pennsylvania, 33 pages, 1901.

No. 89.* Tabulated Analyses of Commercial Fertilizers, 195 pages, 1901.

No. 90. Treatment of San José Scale in Orchard and Nursery, 33 pages, 1902.

No. 91. Canning of Fruits and Vegetables, 57 pages, 1902.

No. 92.* List of Licenses Granted by the Dairy and Food Commmissioner, 193 pages, 1902.

No. 93. The Fundamentals of Spraying, 35 pages, 1902.

No. 94. Phosphates—Phosphatic or Phosphoric Acid Fertilizers, 87 pages, 1902.

No. 95.* County and Local Agricultural Societies, 1902, 12 pages, 1902.

No. 96. Insects Injurious to Cucurbitaceous Plants, 31 pages, 1903.

No. 97. The Management of Greenhouses, 41 pages, 1902.

No. 98. Bacteria of the Soil in their Relation to Agriculture, 88 pages, 1902.

No. 99. Some Common Insect Pests of the Farmer, 32 pages, 1902.

No. 100.* Containing Statement of Work of Dairy and Food Division from January 1, 1902, to June 30, 1902, 223 pages, 1902.

No. 101.* Tabulated Analyses of Commercial Fertilizers, 137 pages, 1902.

No. 102. The Natural Improvement of Soils, 50 pages, 1902.

No. 103.* List of Farmers' Institutes of Pennsylvania, 67 pages, 1902.

No. 104. Modern Dairy Science and Practice, 127 pages, 1902.

No. 105.* Potato Culture, 9 pages, 1902.

No. 106.* The Varieties of Fruit that can be Profitably Grown in Pennsylvania, 50 pages, 1902.

No. 107. Analyses of Concentrated Commercial Feed Stuffs, 62 pages, 1903.

No. 109.* Tabulated Analyses of Commercial Fertilizers, 208 pages, 1903.

No. 110.* Containing Statement of Work of Dairy and Food Division from July 1, to December 31, 1903, 248 pages, 1903.

No. 111.* Small Fruits, their Origin, Culture and Marketing, 66 pages, 1903.

No. 112.* List of County and Local Agricultural Societies, 10 pages, 1903.

No. 113. Methods of Milking, 96 pages, 1903.

No. 114.* Tabulated Analyses of Commercial Fertilizers, 116 pages, 1903.

No. 115. Proceedings of Annual Meeting of Farmers' Institute Managers and Lecturers, 210 pages, 1903.

No. 116.* Farmers' Institutes in Pennsylvania, Season 1903-1904, 64 pages, 1903.

No. 117. Potash Fertilizers—Sources and Methods of Application, 46 pages, 1903.

No. 118.* Containing the Laws Creating the Office of Dairy and Food Commissioner in Pennsylvania, and also a Digest of the Acts of Assembly Committed to his Administration, 62 pages, 1903.

No. 119.* Tabulated Analyses of Commercial Fertilizers, 115 pages, 1903.

No. 120. The Apple-tree Tent-caterpillar, 46 pages, 1903.

No. 121. Address of Hon. Joseph W. Hunter, State Highway Commissioner, Delivered at Annual Meeting of State Board of Agriculture, January 28, 1904, 16 pages, 1903.

No. 122.* Analyses of Concentrated Commercial Feeding Stuffs, 52 pages, 1904.

No. 123. Chestnut Culture, 50 pages, 1904.

No. 124.* County and Local Agricultural Fairs, 10 pages, 1904.

No. 125. The Source and Nature of Bacteria in Milk, 41 pages, 1904.

No. 126.* Tabulated Analyses of Commercial Fertilizers, January 1, to August 1, 140 pages, 1904.

No. 127.* Farmers' Institutes in Pennsylvania, 71 pages, 1904.

No. 128. Grape Culture, 62 pages, 1904.

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*Note.—Edition exhausted.

No. 129. Alfalfa Culture in Humid Land, 64 pages, 1904.
No. 130. The Cow-pea in the North, 41 pages, 1904.
No. 131. Proceedings, State Board of Agriculture and Farmers' Normal Institute, 260 pages, 1904.
No. 132.* Analyses of Commercial Fertilizers, August 1, to December 31, 70 pages, 1904.
No. 133. The Improvement of Corn in Pennsylvania, 76 pages, 1904.
No. 134. Proceedings of the Twenty-eighth Annual Meeting of the State Board of Agriculture, 152 pages, 1905.
No. 135. Analyses of Concentrated Feeding Stuffs, 41 pages, 1905.
No. 136.* List of County and Local Agricultural Societies, 8 pages, 1905.
No. 137. Proceedings, Spring Meeting State Board of Agriculture and Farmers' Annual Normal Institute, 216 pages, 1905.
No. 138.* Analyses Concentrated Commercial Fertilizers, January 1, to August 1, 106 pages, 1905.
No. 139.* Farmers' Institutes in Pennsylvania, 1905-1906, 93 pages, 1905.
No. 140. Sheep Husbandry, 69 pages, 1905.
No. 141.* Laws Relating to the Dairy and Food Division, 47 pages, 1905.
No. 142.* Analyses Concentrated Commercial Fertilizers, August 1, to December 31, 61 pages, 1905.
No. 143. Poultry in Pennsylvania, 36 pages, 1906.
No. 144. Proceedings of 29th Annual Meeting State Board of Agriculture, 191 pages, 1906.
No. 145.* Commercial Feeding Stuffs in Pennsylvania, 51 pages, 1906.
No. 146.* List of County and Local Agricultural Societies, 10 pages, 1906.
No. 147. Market Gardening, 53 pages, 1906.
No. 148. Report of the Bee-Keepers Association of Penna., 57 pages, 1906.
No. 149.* Analyses Commercial Fertilizers January 1-August 1, 1906. 80 pages, 1906.
No. 150.* Farmers' Institutes in Penna., for year 1906-1907, 73 pages, 1906.
No. 151. Proceedings Spring Meeting of State Board of Agriculture and Farmers Annual Normal Institute, 190 pages, 1906.
No. 152. Fruit for Pennsylvania, 330 pages, 1906.
No. 153. Analyses Commercial Fertilizers August 1-December 31, 1906, 60 pages, 1906.
No. 154. Proceedings State Board of Agriculture for 1907, 158 pages, 1907.
No. 155. Commercial Feeding Stuffs of Pennsylvania for 1906, 47 pages, 1907.
No. 156. List of County and Agricultural Fairs for 1907, 10 pages, 1907.
No. 157. Proceedings of Farmers' Normal Institute and State Board of Agriculture, 210 pages, 1907.
No. 158.* Farmers Institutes for year 1907-1908, 78 pages, 1907.
No. 159. Analysis of Commercial Fertilizers of Spring Samples, 69 pages, 1907.
No. 160.* Laws relating to Dairy and Food Division, 69 pages, 1907.
No. 161. Papers Read at Farmers Institutes, 1906-1907, 124 pages, 1907.
No. 162.* Breakfast Foods, 40 pages, 1907.
No. 163. Analyses of Commercial Fertilizers from Fall Samples, 51 pages, 1907.

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*Note.—Edition exhausted.

FERTILIZER VALUATIONS—1907.

The object of an official valuation of commercial fertilizers is to enable the consumer to judge approximately whether he has been asked to pay for a given brand more than the fertilizing ingredients it contains and market conditions prevailing at the time would warrant. It is clear, therefore, that no attempt is made in this valuation to indicate whether the fertilizer valued possesses a greater or less crop-producing capacity than another fertilizer; but only whether it is higher priced than another of the same general composition.

For this purpose it must be so computed as to include all the elements entering into the cost of a fertilizer as it is delivered to the consumer. These elements may be conveniently grouped as follows:

1. The wholesale cost of the ingredients.
2. The jobbers' gross profit on the sale of the ingredients; this includes office expenses, advertising, losses, etc.; for the purpose of the present computation it may be assumed that the sum of this gross profit and the wholesale cost of the ingredients, is equivalent to the retail price of the single ingredients near the wholesale markets in ton lots of original packages for cash.
3. The expense and profit of mixing: This item applies only to complete fertilizers, rock and potash, and ammoniated rock; not to dissolved or ground bone, or to dissolved rock.
4. The expense and profit of bagging.
5. Agents' commissions: This item includes not only the commission proper, but every advance in price due to the sale of the goods through an agent in small quantities on time, rather than directly to the consumer in ton lots for cash.
6. Freight from the wholesale market to the point of delivery.

The valuations for 1906 were based:

1. Upon the wholesale prices from September 1, 1905, to March 1, 1906, of the raw materials used in fertilizer manufacture, the quotations of the New York market being adopted for all materials except acidulated phosphate rock and ground bone.
2. Upon an allowance of 20 per cent. of the wholesale prices, above mentioned, to cover jobbers' profit.

By adding the 20 per cent. allowed for jobbers' gross profit to the wholesale price of the several raw materials, the retail price in original packages at the jobbers' warehouse is obtained.

Since the amount of the several valuable fertilizing constituents in the various raw materials is known, it is a simple matter to determine the corresponding retail value per pound of the valuable fertilizing constituents yielded by each raw material. A schedule of these pound values affords a convenient basis of computation of the value per ton of various fertilizers, whose computation is ascertained by analysis.

The values assigned, for the present, to the other elements in the cost of the fertilizer at the point of delivery are:

3. For mixing, $1.00 per ton.
4. For bagging, $1.00 per ton, in all cases except those in which the article was sold in original packages; the cost of the package being, in such cases, included in the wholesale price.
5. For agents' commissions, 20 per cent. of the cost of the goods f. o. b. at the jobbers' or mixers' warehouse.
6. For freight, $2.00 per ton; the cost of the freight in lots of twelve tons or over, from the seaboard to Harrisburg, averaging $1.88 per ton.

The following valuation of dissolved South Carolina rock illustrates the method:

Soluble,	11.50	230 lbs. at 3c.	$6 90
Reverted,	2.50	50 lbs. at 2½c.	1 25
Insoluble,	1.00	20 lbs. at 1½c.	30
Retail cash value of ingredients,			$8 45
Bagging,			1 00
Cash value of goods ready for shipment,			$9 45
Agents' commissions, 20 per cent.,			1 89
Freight,			2 00
Commercial value per ton,			$13 34

It is not to be expected, of course, that the valuations thus computed will precisely represent the fair price to be charged for a brand in each locality and in every transaction. Market conditions, competition, distance from factory, all introduce minor variations. Nevertheless, to make the approximation reasonably close the average valuation of a given class of goods ought to agree closely with its ascertained average selling price. Whenever such an agreement is no longer obtained by the use of a schedule, it is evident that the schedule of retail values of the constituents, or the added allowances for mixing, etc., requires revision.

It is needful to note here another factor greatly affecting the practical accuracy of these approximations. Their computations would offer little difficulty and their usefulness be far greater, if, by the ordinary methods of analysis, the exact nature of the ingredients used to supply the several fertilizer constituents, were capable of certain determination. This, is, however, possible, to-day, to only a limited extent. The valuations are, therefore based on the assumption that the fertilizers are uniformily compounded from high quality ingredients, such as are commonly employed in the manufacture of fertilizers of the several classes. Consumers should carefully avoid the error of accepting such valuations as infallible; they are not designed to be used for close comparisons of single brands, but only to indicate whether the price asked for a fertilizer is abnormal, assuming good quality for the ingredients used. From this it is clear that, except as high freights may require, the selling price of a brand should not far exceed the valuation; but that a fertilizer may be made of inferior materials and yet have a high valuation.

The valuations used during 1905 were modified for use during 1906 in accordance with the changes in wholesale prices of fertilizing ingredients and to make the valuations more closely follow the selling price.

The following comparative statement shows the valuations and selling prices of the several classes of fertilizers during 1902 to 1906:

Fertilizers.	Number of samples.	Valuation.	Selling price.	Difference of valuation from selling price.
Spring, 1902.				
Complete,	289	25.33	24.10	1.23
Rock-and-potash,	66	15.05	16.45	—1.40
Dissolved bone,	2	17.35	16.50	.85
Ground bone,	29	26.80	28.52	—1.72
Dissolved rock,	59	13.49	13.73	—.24
Fall, 1902.				
Complete,	229	23.31	21.83	1.48
Rock-and-potash,	62	14.46	15.98	—1.52
Dissolved bone,	6	27.08	25.30	1.78
Ground bone,	27	27.51	28.09	—.58
Dissolved rock,	56	13.70	13.47	.23
Spring, 1903.				
Complete,	365	24.29	24.57	—.28
Rock-and-potash,	82	14.73	17.20	—2.47
Dissolved bone,	3	30.87	31.17	—.30
Ground bone,	27	27.25	28.67	—1.42
Dissolved rock,	56	13.34	15.13	—1.79
Fall, 1903.				
Complete,	264	22.77	21.98	.79
Rock-and-potash,	74	14.86	15.96	—1.10
Dissolved bone,	11	24.57	23.67	.90
Ground bone,	49	27.07	27.52	—.45
Dissolved rock,	60	13.12	14.64	—1,52
Spring, 1904.				
Complete,	349	25.07	24.28	.79
Rock-and-potash,	75	15.45	16.47	—1.02
Dissolved bone,	2	28.42	31.50	—3.08
Ground bone,	22	27.77	28.20	—.43
Dissolved rock,	41	14.06	14.59	—.53

Fertilizers.	Number of samples.	Valuation.	Selling price.	Difference of valuation from selling price.
Fall, 1904.				
Complete,	256	22.53	21.82	.71
Rock-and-potash,	68	14.92	15.89	—.97
Dissolved bone,	6	27.77	24.94	2.83
Ground bone,	38	27.97	27.02	.95
Dissolved rock,	45	14.09	13.89	.20
Spring, 1905.				
Complete,	374	25.60	24.63	.97
Rock-and-potash,	82	15.49	16.11	—.62
Dissolved bone,	3	22.70	23.83	—1.13
Ground bone,	27	26.72	29.08	—2.36
Dissolved rock,	47	13.86	13.64	.22
Fall, 1905.				
Complete,	285	22.35	21.39	.96
Rock-and-potash,	74	15.04	15.97	—.97
Dissolved bone,	6	25.85	24.78	1.11
Ground bone,	35	28.70	27.70	1.00
Dissolved rock,	49	13.51	14.21	1.30
Spring, 1906.				
Complete,	412	24.76	23.55	1.21
Rock-and-potash,	99	15.19	16.17	—.98
Dissolved bone,	4	22.65	24.40	—1.75
Ground bone,	34	28.23	29.02	—.79
Dissolved rock,	45	12.98	13.75	—.77
Fall, 1906.				
Complete,	266	22.99	21.87	1.12
Rock-and-potash,	71	15.06	15.76	—.70
Dissolved bone,	7	25.33	22.06	3.27
Ground bone,	34	29.12	27.80	1.32
Dissolved rock,	43	12.99	13.45	—.46

The following statement from the weekly reports of the *Oil, Paint and Drug Reporter*, of New York City, shows the average wholesale prices of fertilizers raw materials from September 1, 1905, to March 1, 1906, and from September 1, 1906, to March 1, 1907:

Wholesale Prices of Fertilizer Ingredients, New York Oil, Paint and Drug Reporter.

Substance.	Amount priced.	Average price Sept. 1, 1905, to March, 1906.	Average price Sept. 1, 1906, to March, 1907.	Prices Sept. to March, 1906-7, in per cent. of prices 1905-6.
Sulphate of ammonia,	Cwt.,	3.1253	3.1152	99.7
Nitrate of soda,	Cwt.,	2.2278	2.5524	114.5
Dried blood, H. G.,	Unit (20 lbs.),	2.6538	2.7561	103.4
Concentrated tankage,	Unit (20 lbs.),	2.2161	2.4463	110.3
Rough bone,	Ton,	15.96	15.50	97.1
Bone meal,	Ton,	22.57	23.00	101.9
Fish guano, dry,	Unit (20 lbs.),	*2.5536	*2.59	101.4
Fish guano, acid,	Unit (20 lbs.),	†2.331	†2.34	100
Refuse bone black, oil,	Ton,	14.00	14.00	100
Refuse bone black, sugar,	Ton,	18.00	18.00	100
Phosphate rock, Charleston,	Ton,	5.125	6.358	124.1
Phosphate rock, Tennessee,	Ton,	3.87	5.825	150.5
Acid phosphate,	Unit (20 lbs.),	.6375	.6375	100
Double manure salt,	Cwt.,	1.18	1.18	100
Sulphate of potash,	Cwt.,	2.20	2.20	100
Kainit,	Ton,	8.50	8.50	100
Muriate of potash,	Cwt.,	1.965	1.965	100
Sulphuric acid, 66 D. G. B.,	Cwt.,	1.20	1.25	104.2

*Bone phosphate of lime 10 cents per unit.
†Bone phosphate of lime 35 cents per unit.

In ammoniates, such as dried blood and fish guano, the unit is of ammonia, of which 82.35 per cent. is nitrogen; in acid phosphate, the unit is of phosphoric acid (phosphorus pentoxid).

Except in the case of sulphate of ammonia and rough bone, the prices of ammoniates have advanced, the increase being especially marked in case of nitrate of soda and concentrated tankage.

The following data are from the monthly reports of Thos. J. White & Co., fertilizer brokers, Baltimore, Md., giving wholesale quotations upon ammoniates, and confirm the figures previously given:

Wholesale Prices of Ammoniates: Reports of Thos. J. White & Co., Baltimore, Md.

	Prices, September to March, 1905-6.	Prices September to March, 1906-7.
Sulphate of ammonia, per cwt.,	3.125	3.0775
Nitrate of soda,	2.203	2.502
Ground blood, f. o. b. Chicago, per unit of ammonia,	2.4893	2.5925
Concentrated tankage, f. o. b. Missouri River, per unit of ammonia,	2.2125	2.39
Unground tankage, 120 per cent. ammonia; 20 per cent. bone phosphate,	....	†*2.30
Ground tankage, f. o. b. Chicago, per unit of ammonia:		
11 per cent. ammonia; 15 per cent. bone phosphate,	†2.312	†2.52
12 per cent. ammonia; 12 per cent. bone phosphate,	....	2.525

*October quotations only.
†Bone phosphate of lime 10 cents.

The following summary is taken from the *Oil, Paint and Drug Reporter:*

Phosphates.—The demand for phosphates throughout the year was unusually active. Prices of phosphate rock showed sharp advances.

Closing prices for the year were as follows:

South Carolina rock, air dried, f. o. b. Ashley River, $6.00@$6.50; Florida land pebble, f. o. b. Port Tampa, $5.75@$6.00; Florida high grade, f. o. b. Florida or Georgia ports, $10.25@$10.50; Tennessee, Mt. Pleasant, domestic, per ton, 78 and 80 per cent., $6.00@$6.25; 75 per cent. guaranteed, $4.50@$4.75; 68 to 72 per cent., $3.50@$3.75.

Raw Materials of Acid Manufacture: Brimstone.—Conditions during the past year have changed. Domestic production having increased, local consumers are relying more on the domestic output. Prices continued steady at $22.12½@ $22.50 until late in the fall, when there was an advance to $22.25@$22.50. The higher prices were brought about by a decrease in supplies at consuming points.

Pyrites.—The increase in the demand assumed such proportions that it exceeded the output. The prices quoted at the beginning of the year were 10 cents per unit for Spanish lump ore washed (48 to 52 per cent sulphur) and 10½ cents for domestic furnace size ore averaging 45 per cent. sulphur, all f. o. b. shipping ports.

During the year prices advanced 1 cent per unit, with indications for further rise very promising.

Sulphuric Acid.—The demand for domestic consumption has been great. Sales at the close of the year were made on the basis of 1 cent and up for 66 degree, and $12.00 per ton and up for bulk 50 degree, depending upon the quality, terms of sale, etc.

According to the same authority, prices of acid phosphate remained firmer, quotations ranging from 60@67½ per unit, according to quantity and point of shipment. These prices show no change from the previous year, notwithstanding the advance in the price of the raw materials of acid phosphate manufacture.

Potash Salts.—The reports of the U. S. Bureau of Statistics show the following entries for consumption during the fiscal year 1905 and 1906:

	1905.	1906.
Muriate (pounds),	202,366,601	211,875,897
Kieserit, kainit, etc.,	240,789	379,220

This trade is so managed that by March nearly all wholesale deliveries of the year are contracted for. The prices for potashes as announced by the German Potash Syndicate on the basis of large lots sold through brokers and delivered at Boston, New York or Philadelphia, are shown in the following table. These prices show no change from last year:

Salt.	March, 1907.	After March, 1907.
Muriate, 80 per cent., per 100 pounds,	1.885	1.915
Sulphate, 48 per cent., per 100 pounds,	2.17	2.20
Double manure salt, 48-53 per cent., per 100 pounds,	1.135	1.165
Kainit, 12.4 per cent., actual potash, per ton,	8.25	8.50
Manure salt, 20 per cent. potash, per ton,	14.68	15.20

Composition of Raw Materials.—In order to form a correct idea of the cost per pound of the fertilizer constituents of these materials, it is needful to determine their composition or, in other words, the quantities of valuable constituents each contain. The following table shows the composition of the raw materials used in the manufacture of fertilizers. No analyses of these materials, with the exception of ground bone and dissolved rock, have been made in

Pennsylvania. The figures in the following table include the averages of the results of analyses made in Connecticut, New Jersey and Massachusetts during the past year, except in the case of ground bone and dissolved rock phosphates, where Pennsylvania results alone are included.

Composition of Non-Acidulated Fertilizer Ingredients. (Per cent.)

	Number of samples analyzed.	Nitrogen.	Potash.	Total phosphoric acid.
Sulphate of ammonia,	2	20.42	....	....
Nitrate of soda,	21	15.44	....	....
Dried blood,	7	12.00	....	....
Ground bone,	68	3.30	....	21.44
Tankage,	7	6.57	....	13.52
Ground fish,	25	7.90	....	7.15
Cotton seed meal,	93	6.60	1.90	3.15
Castor pomace,	7	4.97	1.00	1.90
Sulphate of potash, H. G.,	3	....	49.90	....
Muriate of potash,	12	....	51.14	....
Kainit,	2	....	13.50	....
Double sulphate of potash and magnesia,	7	....	24.86	....

Composition of Acidulated Fertilizer Ingredients. (Per cent.)

	Number of samples analyzed.	Total phosphoric acid.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.
Dissolved bone black†	3	16.74	11.95	3.06	1.73
Dissolved bone,*	11	15.09	4.61	4.59	5.86
Dissolved rock phosphate,	88	15.19	8.97	4.52	1.70

†1905 figures.
*Also contains 1.90 per cent. nitrogen.

Cost per pound of Fertilizer Constituents.—With the composition of these raw materials and their price per ton, hundred weight, or other unit of measure as a basis, the wholesale cost per pound of the valuable constituents can be readily calculated. In many cases the ammoniates are quoted "per unit of ammonia," the term unit being equivalent to per cent.; in goods sold by the ton of 2,000 lbs., the unit is equal to 20 lbs., and 20 lbs. of ammonia contain 16.47 lbs. of nitrogen.

In the case of refuse bone-black, unacidulated, the mean, 28.25 per cent. of phosphoric acid, is assumed to represent the average material on the market.

Phosphate rock is sold by the ton of 2,240 lbs., and on the basis of the bone phosphate of lime it contains, with drawbacks for injurious constituents. Bone-phosphate of lime contains 45.8 per cent. of phosphoric acid; therefore, each per cent. of bone phosphate in a long ton is equivalent to 22.4 lbs., and contains 10.26 lbs., of phosphoric acid.

In the wholseale trade, dried blood, azotine, concentrated tankage and hoof meals are usually sold on the basis of ammonia, disregarding the phosphoric acid present.

Insoluble phosphoric acid in dissolved rock is likewise omitted from consideration, contracts being based solely upon the "available" phosphoric acid; nor in rock phosphates is any claim made for the small quantities of nitrogen and potash they contain, nor in dissolved bone for the potash present.

Under these conditions, the wholesale cost per pound in New York of the valuable constituents of such materials as furnish but a single fertilizing element, these materials being assumed to be in the state of preparation and in the packing in which the manufacturer purchased them, are given in the following table; also a figure representing a fair retail price at the factory, the materials having undergone no change in treatment or packing and the allowance for expenses and profit in retailing being 20 per cent.

Wholesale Cost Per Pound of Fertilizer Constituents. (New York.)
I. Ingredients Supplying One Constituent.

Material.	Constituent valued.	Wholesale price—cents.	Wholesale price plus 20 per cent.
Sulphate of ammonia,	Nitrogen,	15.26	18.31
Nitrate of soda,	Nitrogen,	16.53	19.84
Dried blood, high grade,	Nitrogen,	16.73	20.08
Concentrated tankage,	Nitrogen,	14 51	17.41
Refuse bone black:			
Oil,	Phosphoric acid, total,	2.48	2.98
Sugar,	Phosphoric acid, total,	3.19	3.83
Phosphate rock:*			
Tennessee, 78 per cent.,	Phosphoric acid, total,	.73	88
South Carolina, 60 per cent.,	Phosphoric acid, total,	1.16	1.39
Acid phosphate,	Phosphoric acid, available,	3.19	3.83
Double manure salts,	Potash,	4.38	5.26
Sulphate of potash,	Potash,	4.52	5.42
Muriate of potash,	Potash,	3.73	4.48
Kainit,	Potash,	2.97	3.56

*The prices of phosphate rock are f. o. b. at the prespective points of shipment, not New York. The prices for potash are taken from the schedule of the syndicate. The prices for concentrated tankage are taken from the reports of Thos. J. White & Co., and those of the remainder from the Oil, Paint and Drug Reporter.

The quotations for bone are given without specific reference to quality, so that it is impossible from these data to fairly apportion their several wholesale values to the nitrogen and phosphoric acid contained in this material. As compared with tankage, the general tendency is to assign a higher commercial rating to the phosphoric acid in bone and to the nitrogen, a rating not very different from that given in tankage.

In previous years the value assigned to the nitrogen has been the same as that quoted on crushed tankage c. a. f. Baltimore.

Quotations for crushed tankage not being available at this time, the present value for nitrogen is based upon quotations for ground tankage, 11 per cent. ammonia, 15 per cent. bone phosphate, f. o. b. Chicago, which, according to the reports of Thos. J. White & Co., Baltimore, during September, 1906, to March, 1907, have been $2.52 per unit of ammonia.

During the three preceeding years, quotations on crushed tankage, c. a. f. Baltimore, have been on an average 12.67 per cent. in advance of those on ground tankage, 11 and 15 f. o. b. Chicago. Increasing the price of ground tankage as quoted above by this percentage, we have $2.839 per unit of ammonia as the value assigned to the nitrogen in bone.

This is equivalent to $3.44 per unit in nitrogen The average composition of the ground bone and bone meal samples analyzed last fall in Pennsylvania was: Phosphoric acid, 22.00 per cent.; nitrogen, 3.26 per cent. The prepared bone contains less fat and moisture, and often less nitrogen than the ordinary rough bone, but these differences tend, in a manner, to neutralize each other. Assuming for the rough bone quoted in the New York market the same composition as the bone meal sold in Pennsylvania, and for the value of the nitrogen $3.44 per unit, as previously stated, the values per pound of the several constituents would be:

Wholesale Cost per Pound of Fertilizer Constituents, New York. II. Bone.

	Constituent valued.	Wholesale price—cents.	Wholesale price plus 20 per cent.—cents.
Rough bone,	Nitrogen,	17.20	20.64
	Phosphoric acid,	.98	1.18
Ground bone,	Nitrogen,	25.52	30.62
	Phosphoric acid,	1.45	1.74

Valuation in Neighboring States.

It is desirable, from all points of view, that the schedules of valuation throughout a district in which similar market conditions prevail, should differ as little as possible. It has been our practice in the past, to conform our schedule to that adopted after very careful cooperative study of market conditions for each year, by the New England States and New Jersey, except where the peculiar conditions of our markets have made the valuations diverge too largely from the actual selling prices, as in the case of ground bone and dissolved rock phosphates. The schedules for these States for 1905 and 1906 are as follows:

Trade Values Adopted by the New England States and New Jersey.

	Cents Per Pound.		Values in 1907 in per cent. of those of 1906.
	1906.	1907.	
Nitrogen:			
In ammonia salts,	17½	17½	100
In nitrates,	16½	18½	112.1
In dry and fine ground fish,	18½	20½	110.8
In meat blood and mixed fertilizers,	18½	20½	110.8
In fine ground bone and tankage,	18.0	20½	113.9
In coarse bone and tankage,	13.0	15	115.4
Phosphoric acid:			
Water soluble,	4½	5	111.1
Citrate soluble,	*4.0	4½	112.5
In cotton seed meal, castor pomace, fine ground fish and wood ashes,	4.0	4.0	100
In fine bone and tankage,	4.0	4.0	100
In coarse bone and tankage,	3.0	3.0	100
In mixed fertilizers, insoluble,	2.0	2.0	100
Potash:			
In forms free from muriate,	5.0	5.0	100
As muriate,	4¼	4¼	100

*Except in New Jersey, where owing to the legal requirements of methods which indicate a less quantity of citrate soluble than is obtained by use of the official method a valuation of 4½ cents per pound has been adopted.

These values show changes since March 1, 1906, corresponding quite closely to the main changes shown in wholesale market reports. In the case of bone and rock phosphate goods, the correspondence is not so readily apparent. It should be borne in mind that the New England Station's schedule is based not solely upon the wholesale quotations from September to March, but also upon contract prices and retail quotations during January and February.

As in preceding years Pennsylvania retail selling prices for dissolved rock and ground bone bear no close correspondence to New York wholesale prices for these commodities. Independent valuations must therefore be made.

Respecting dissolved rocks, the computed commercial valuations of last year were, each season, lower on the average than the selling price. Meanwhile, though New York quotations for acid phosphate show, as yet, no change, the price of sulphur has slightly increased, that of pyrites more pronouncedly, and those of phosphate rocks, from 25 to 50 per cent. Labor costs have also increased. On these grounds, it has been decided to add one-half cent per pound to the values for water soluble and citrate soluble phosphoric acid, thus increasing the total valuation of the average dissolved rock by about $1.50. This increase corresponds to that made for phosphoric acid in complete fertilizers.

Respecting bone: The average commercial valuation for ground bone in 1906 corresponded quite well to the selling price. New York wholesale quotations show no increase in rough bone prices. Tankage values for nitrogen have, however, markedly increased. This, together with the increased prices for nitrogen from other sources, will tend to cause a change in like direction in the value of bone nitrogen. For this reason, the values for nitrogen in fine and coarse bone and tankage have been somewhat increased.

Schedule of Values for Fertilizer Ingredients, 1907.

	Cents per Pound.
Nitrogen:	
In ammonia salts,	17½
In nitrates,	18½
In meat, dried blood and mixed fertilizers,	20½
In fine ground bone and tankage,	15
In coarse bone and tankage,	13
Phosphoric acid:	
Soluble in water, in bone fertilizers,	5
Soluble in water, in rock fertilizers,	3½
Soluble in ammonium citrate, in bone fertilizers,	4½
Soluble in ammonium citrate, in rock fertilizers,	3
Insoluble in ammonium citrate, in bone fertilizers	2
Insoluble in ammonium citrate, in rock fertilizers,	1½
In fine bone, tankage and fish,	3
In coarse bone and tankage,	2½
In cotton seed meal, caster pomace and wood ashes,	4
Potash:	
In high grade sulphate or forms free from muriate,	5
As muriate,	4¼

Potash in excess of that equivalent to the chlorin present, will be valued as sulphate, and the remainder as muriate.

Nitrogen in mixed fertilizers will be valued as derived from the best sources of organic nitrogen, unless clear evidence to the contrary is obtained.

Phosphoric acid in mixed fertilizers is valued at bone phosphoric acid prices, unless clearly found to be derived from rock phosphate.

Bone is sifted into two grades of fineness: Fine, less than 1-50 inch in diameter; coarse, over 1-50 inch in diameter.

The result obtained by the use of this schedule does not cover the items of mixing, bagging, freight and agents' commission. To cover these, allowances are made as follows:

For freight, an allowance of $2.00 per ton on all fertilizers.

For bagging, an allowance of $1.00 per ton on all fertilizers, except when sold in original packages.

For mixing, an allowance of $1.00 per ton on complete fertilizers and rock-and-potash goods.

For agents' commission, an allowance of 20 per cent. is added to the cash value of the goods ready for shipment.

FERTILIZER ANALYSES JANUARY 1, TO AUGUST 1, 1907.

Since January 1, 1907, there have been received from authorized sampling agents fifteen hundred and ninety-nine fertilizer samples, of which six hundred and two were subjected to analysis, the remainder being rejected either because they represented brands analyzed last season, it being impracticable to analyze all brands received, or because they were regarded as not certainly representative of the brand whose name they bore. Preference is given to those which have not been so recently analyzed. In certain cases when two or more samples representing the same brand were received, equal portions from the several samples were united, and the composite sample was subjected to analysis.

The samples analyzed group themselves as follows: 424 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 6 dissolved bones, furnishing phosphoric acid and nitrogen; 103 rock-and-potash fertilizers, furnishing phosphoric acid and potash; 41 acidulated rock phosphates, furnishing phosphoric acid only; 27 ground bones, furnishing phosphoric acid and nitrogen, and one miscellaneous sample, which group includes substances not properly classified under the foregoing heads.

The determinations to which a complete fertilizer is subjected are as follows: (1) Moisture, useful for the comparison of analyses, for indication of dry condition and fitness for drilling, and also of the conditions under which the fertilizer was kept in the warehouse. (2) Phosphoric acid—total, that portion soluble in water, and of the residue, that portion not soluble in warm ammonia citrate solution (a solution supposed to represent the action of plant roots upon the fertilizer), which is assumed to have little immediate food value. By difference, it is easy to compute the so-called "reverted" acid, which is the portion insoluble in water but soluble in the citrate. The sum of the soluble and reverted is commonlly called the "available" phorphoric acid. (3) Potash soluble in water—most of that present in green sand marl and crushed minerals, and even some of that present in vegetable materials such as cotton-seed meal, not being included because insoluble in water even after long boiling. (4) Nitrogen—This element is determined by a method which simply accounts for all present, without distinguishing between the quantities present in the several forms of ammonium salts, nitrates or organic matter. (5) Chlorin—this determination is made to afford a basis for estimating the proportion of the potash that is present as chlorid or muriate, the cheapest source. The computation is made on the assumption that the chlorin present, unless in excess, has been introduced in the form of muriate of potash; but doubtless there are occasional exceptions to this rule. One part of chlorin combines with 1.326 parts of potash to form the pure muriate; knowing the chlorin, it is, therefore, easy to compute the potash equivalent thereto. (7) In the case of ground bone, the state of sub-division is determined by sifting through accurately made sieves; the cost of preparation and especially the promptness of action of bone in the soil depends very largely on the fineness of its particles the finer being much more quickly useful to the plant.

The law having required the manufacturer to guarantee the amount of certain valuable ingredients present in any brand he may put upon the market, chemical analysis is employed to verify the guaranties stamped upon the fertilizer sacks. It has, therefore, been deemed desirable in this report to enter the guaranty filed by the manufacturer in the office of the Secretary of Agriculture, in such connection with the analytical results that the two may be compared. An unfortunate practice has grown up among manufacturers of so wording the guaranty that it seems to declare the presence in the goods of an amount of a valuable constituent ranging from a certain minimum to a much higher maximum; thus, "Potash, 2 to 4 per cent." is a guaranty not infrequently given. In reality, the sole guaranty is for 2 per cent. The guaranteed amounts given for each brand in the following tables, are copied from the guaranties filed by the maker of the goods with the Secretary of Agriculture, the lowest figure given for any constituent being considered to be the amount guaranteed For compactness and because no essentially important fact is suppressed thereby, the guaranties for soluble and reverted phosphoric acid have not been given separately, but are combined into a single guaranty for available phosphoric acid; in cases where the maker's guaranty does not specifically mention available phosphoric acid, the sum of the lowest figures given by him for soluble and reverted phosphoric acid is used. The law of 1879 allowed the maker to express his guaranty for nitrogen either in terms of that element or in terms of the ammonia equivalent thereto; since ammonia is composed of tree parts of hydrogen and fourteen parts of nitrogen, it is a very simple matter to calculate the amount of one, when the amount of the other is given; the amount of nitrogen multiplied by 1.214 will give the corresponding amount of ammonia, and the amount of ammonia multiplied by 0.824 will give the corresponding amount of nitrogen. In these tables, the expression is in terms of nitrogen.

The law of 1901 abolishes this alternative and requires that the guaranty shall be given in terms of nitrogen, Many manufacturers after complying with the terms of the law, insert additional items in their guaranties, often with the result of misleading or confusing the buyer; the latter will do well to give heed to those items only that are given as the law requires and that are presented in these tables.

A summary of the analyses made this season may be presented as follows:

Summary of Analyses Made This Season.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Number of analyses,	424	103	6	41	27
Moisture, per cent.,	9.57	10.54	8.54	9.95	5.28
Phosphoric acid:					
Total, per cent.,	9.92	11.44	14.68	15.41	21.43
Soluble, per cent.,	4.32	5.59	5.46	9.14	....
Reverted, per cent.,	3.83	4.54	5.97	4.66	....
Insoluble, per cent.,	1.77	1.31	3.25	1.61	....
Potash, per cent.,	4.53	3.55	....	....	....
Nitrogen, per cent.,	1.57	....	1.45	....	3.35
Mechanical analyses of bone:					
Fine,	....	....	....	....	75
Coarse,	....	....	....	....	25
Commercial valuation,	26.83	16.50	25.08	14.82	29.64
Average selling price,	24.60	16.94	22.28	14.04	31.55
Commercial value of samples where selling price is ascertained,	26.84	16.53	25.08	14.72	29.64

The cases of departure of goods from their guaranteed composition observed this season, including only those cases in which it amounted to two-tenths per cent., or more, were as follows:

Summary of Instances of Deficiency From Guaranty.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Deficient in four constituents,	3	....	....	....	....
Deficient in three constituents,	12	4	....	....	....
Deficient in two constituents,	41	14	....	1	....
Deficient in one constituent,	111	27	1	7	5
Total number of samples in which deficiencies occur,	167	45	1	8	5

The cases of deficiency noted during the past ten seasons in goods as compared with their guaranties expressed in percentage of the total number of goods of each class analyzed, are as follows:

Percentage of Deficiency 1902-1906.

	Fall, 1902.	Spring, 1903.	Fall, 1903.	Spring, 1904.	Fall, 1904.	Spring, 1905.	Fall, 1905.	Spring, 1906.	Fall, 1906.	Spring, 1907.
Complete fertilizers,	36.7	37.5	37.9	39.5	49.2	35.3	37.5	45.4	39.5	39.4
Dissolved bone,	50.0	33.3	63.6	*	50.0	†100.0	66.6	50.0	28.5	16.6
Rock and potash,	43.5	32.9	43.2	50.7	35.3	30.9	33.0	42.4	40.0	43.7
Dissolved rock,	8.9	23.2	20.0	20.0	11.1	9.3	10.0	28.8	25.6	19.5
Ground bone,	25.0	33.3	......	36.3	36.8	40.0	31.4	49.0	14.7	18.5
All classes except miscellaneous,	33.2	35.1	44.7	39.6	41.4	32.8	31.4	43.8	35.8	36.1

*Only two samples analyzed for which no guarantees are reported.
†Only two samples analyzed for which guarantees are recorded.

A comparison of the average composition of all samples of complete fertilizers for which guaranties are recorded with the average of the corresponding guaranties, for several seasons past including those of this season follow:

Average Composition and Guaranty Compared.

	Average composition. Per cent.	Average guaranty. Per cent.
Fall, 1902.		
Phosphoric acid:		
Total,	12.58	11.40
Available,	9.95	9.29
Potash,	2.69	2.60
Nitrogen,	1.57	1.55
Spring, 1903.		
Phosphoric acid:		
Total,	11.90	10.67
Available,	9.36	8.73
Potash,	3.85	3.63
Nitrogen ,	1.58	1.61
Fall, 1903.		
Phosphoric acid:		
Total,	10.76	9.65
Available,	8.84	8.13
Potash,	4.09	3.90
Nitrogen,	1.33	1.29
Spring, 1904.		
Phosphoric acid:		
Total,	10.24	9.32
Available,	8.27	7.87
Potash,	4.09	3.90
Nitrogen,	1.58	1.55
Fall, 1904.		
Phosphoric acid:		
Total,	10.49	9.72
Available,	8.59	7.70
Potash,	2.87	2.81
Nitrogen,	1.25	1.20
Spring, 1905.		
Phosphoric acid:		
Total,	10.16	9.42
Available,	8.50	7.92
Potash,	4.55	4.22
Nitrogen,	1.61	1.58

Average Composition and Guaranty Compared—Continued.

	Average composition.	Average guaranty. Per cent.
Fall, 1905.		
Phosphoric acid:		
Total,	10.63	9.62
Available,	8.72	8.13
Potash,	2.90	2.42
Nitrogen,	1.26	1.20
Spring, 1906.		
Phosphoric acid:		
Total,	9.73	9.21
Available,	7.88	7.77
Potash,	4.21	3.95
Nitrogen,	1.57	1.53
Fall, 1906.		
Phosphoric acid:		
Total,	10.45	9.70
Available,	8.23	8.16
Potash,	3.12	2.95
Nitrogen,	1.32	1.31
Spring, 1907.		
Phosphoric acid:		
Total,	9.21	8.50
Available,	8.13	7.83
Potash,	4.55	4.31
Nitrogen,	1.52	1.47

It is of interest to note how closely the series of valuations, based upon the wholesale prices of raw materials in the principal markets during the most important buying season and upon certain average allowances for expenses and profits on the part of the mixer and jobber, coincide with the retail prices later ascertained. A comparison for several seasons past is given below:

Comparison of Selling Price and Valuation, 1902-1907.

	Selling price.	Valuation.	Excess of valuation over selling price.
Complete fertilizers:			
1902, Spring,	24.10	25.33	1.25
Fall,	21.83	23.31	1.48
1903, Spring,	24.57	24.15	—.42
Fall,	21.98	22.77	.79
1904, Spring,	24.28	24.99	.71
Fall,	21.82	22.53	.71
1905, Spring,	24.63	25.60	.97
Fall,	21.39	22.35	.96
1906, Spring,	23.55	24.76	1.21
Fall,	21.87	22.99	1.12
1907, Spring,	24.60	26.84	2.24
Dissolved bone:			
1902, Spring,	16.50	17.35	.85
Fall,	25.30	27.08	1.78
1903, Spring,	31.17	30.87	—.30
Fall,	23.67	24.57	.90
1904, Spring,	31.50	28.42	—3.08
Fall,	24.94	27.77	2.83

	Selling price.	Valuation.	Excess of valuation over selling price.
1905, Spring,	23.83	22.70	—1.13
Fall,,	24.78	25.85	1.11
1906, Spring,	24.40	22.65	—1.75
Fall,	22.06	25.33	3.27
1907, Spring,	22.28	25.08	2.80
Rock and potash:			
1902, Spring,	16.45	15.05	—1.40
Fall,	15.97	14.46	—1.51
1903, Spring,	17.20	14.74	—2.46
Fall,	15.96	14.86	—1.10
1904, Spring,	16.47	15.46	—1.01
Fall,	15.89	14.92	—.97
1905, Spring,	16.11	15.49	—.62
Fall,	15.97	15.04	—.97
1906, Spring,	16.17	15.19	—.98
Fall,	15.76	15.06	—.70
1907, Spring,	16.94	16.53	—.41
Dissolved rock:			
1902, Spring,	13.73	13.49	—.24
Fall,	13.54	13.70	.12
1903, Spring,	15.13	13.34	—1.79
Fall,	14.64	13.12	—1.52
1904, Spring,	14.59	14.05	—.54
Fall,	13.89	14.09	.20
1905, Spring,	13.64	13.86	.22
Fall,	12.21	13.51	1.30
1906, Spring,	13.75	12.98	—.77
Fall,	13.45	12.99	—.46
1907, Spring,	14.04	14.72	.68
Ground bone:			
1902, Spring,	28.52	26.80	—1.72
Fall,	28.09	27.51	—.58
1903, Spring,	28.67	27.25	—1.42
Fall,	27.52	27.07	—.45
1904, Spring,	28.20	27.70	—.50
Fall,	27.02	27.97	.95
1905, Spring,	29.08	26.72	—2.36
Fall,	27.70	28.70	1.00
1906, Spring,	29.02	28.23	—.79
Fall,	27.80	29.12	1.32
1907, Spring,	31.55	29.64	—1.91

From this comparison, it appears that the valuation of complete fertilizers, made upon the same principles that have been accepted for years, give an average result $2.24 in excess of the actual retail selling prices, although no special allowance had been made for the increased cost of labor and materials involved in mixing and bagging. It is obvious that either the wholesale quotations represent less closely than usual the average wholesale transaction of the past season, or that manufacturers have retailed during the past season on a narrower than usual margin of profit, expressed in percentage of the wholesale cost of raw materials and of manufacture.

The same divergance appears in the valuation of the few samples of dissolved bone represented in the analyses.

In the case of rock-and-potash and dissolved rock, the valuations correspond more closely with the selling prices.

The bone valuations are $1.91 less than the average selling price, so that the nitrogen valuation may not have been sufficiently raised to represent market conditions.

The work of the past season was allotted as follows: Reception and custody of samples, supervision of computations, M. S. McDowell; determination of total phosphoric acid, A. W. Broomell; of soluble and reverted phosphoric acid, J. W. White, assisted by H. D. Edmiston; potash, G. C. Given; nitrogen, A. R. Mertz; computer, Miss Alice Jones.

In the following tables are presented the results of analyses made of the several samples, single or composite, received from the official sampling agents during this season, except a few withheld from publication by direction of the Secretary of Agriculture because they represent goods concerning whose brand name there is some disagreement between the manufacturer's statement filed with the Department of Agriculture and the reports of sampling agents, or with respect to which the information is incomplete in some other important particulars. It is deemed best not to delay the publication of this bulletin until the information upon the points in question has been secured, but it is expected that the facts will have been ascertained with sufficient exactness to warrant the publication of these analyses in the fall bulletin

FERTILIZER ANALYSES AUGUST 1, TO DECEMBER 31, 1907.

Since August 1, 1906, there have been received from authorized sampling agents eleven hundred and ten fertilizer samples, of which four hundred and twenty-two were subjected to analysis, the remainder being rejected either because they represented brands analyzed last season or because they were regarded as not certainly representative of the brand whose name they bore. When two or more samples representing the same brand were received equal portions from the several samples were united and the composite samples were subjected to analysis.

The samples analyzed group themselves as follows, 266 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 7 dissolved bones, furnishing phosphoric acid and nitrogen; 71 rock-and-potash fertilizers, furnishing phosphoric acid and potash; 43 acidulated rock phosphates, furnishing phosphoric acid only; 34 ground bones, furnishing phosphoric acid and nitrogen, and one miscellaneous sample, which group includes substances not properly classified under the foregoing heads.

The determinations to which a complete fertilizer is subjected are as follows: (1) Moisture, useful for the comparison of analyses, for indication of dry condition and fitness for drilling, and also of the conditions under which the fertilizer was kept in the warehouse. (2) Phorphoric acid—total, that portion soluble in water, and of the residue, that portion not soluble in warm ammonia citrate solution (a solution supposed to represent the action of plant roots upon the fertilizer), which is assumed to have little immediate food value. By difference, it is easy to compute the so-called "reverted" acid, which is the portion insoluble in water, but soluble in the citrate. The sum of the soluble and reverted is commonly called the "available" phorphoric acid. (3) Potash soluble in water—most of that present in green sand marl and crushed minerals, and even some of that present in vegetable materials such as cotton-seed meal, not being included because insoluble in water even after long boiling. (4) Nitrogen—This element is determined by a method which simply accounts for all present, without distinguishing between the quantities present in the several forms of ammonium salts, nitrates or organic matter. (5) Chlorin; this determination is made to afford a basis for estimating the proportion of the potash that is present as chlorid or muriate, the cheaper source. The computation is made on the assumption that the chlorin present, unless in excess, has been introduced in the form of muriate of potash; but doubtless there are occasional exceptions to this rule. One part of chlorin combines with 1.326 parts of potash to form the pure muriate; knowing the chlorin, it is, therefore, easy to compute the potash equivalent thereto. (7) In the case of ground bone, the state of sub-division is determined by sifting through accurately made sieves; the cost of preparation and especially the promptness of action of bone in the soil depends very largely on the fineness of its particles the finer being much more quickly useful to the plant.

The law having required the manufacturer to guarantee the amount of certain valuable ingredients present in any brand he may put upon the market, chemical analysis is employed to verify the guaranties stamped upon the fertilizer sacks. It has, therefore, been deemed desirable in this report to enter the guaranty filed by the manufacturer in the office of the Secretary of Agriculture, in such connection with the analytical results that the two may be compared. An unfortunate practice has grown up among manufacturers of so wording the guaranty that it seems to declare the presence in the goods of an amount of a valuable constituent ranging from a certain minimum to a much higher maximum; thus, "Potash, 2 to 4 per cent." is a guaranty not infrequently given. In reality, the sole guaranty is for 2 per cent. The guaranteed amounts given for each brand in the following tables, are copied from the guaranties filed by the maker of the goods with the Secretary of Agriculture, the lowest figure given for any constituent being considered to be the amount guaranteed. For compactness and because no essentially important fact is suppressed thereby, the guaranties for soluble and reverted phosphoric acid have not been given separately, but are combined into a single guaranty for available phosphoric acid; in cases where the maker's guaranty does not specifically mention available phosphoric acid, the sum of the lowest figures given by him for soluble and reverted phosphoric acid is used. The law of 1879 allowed the maker to express his guaranty for nitrogen either in terms of that element or in terms of the ammonia equivalent thereto; since ammonia is composed of three parts of hydrogen and fourteen parts of nitrogen, it is a very simple matter to calculate the amount of one, when the amount of the other is given; the amount of nitrogen multiplied by 1.214 will give the corresponding amount of ammonia, and the amount of ammonia multiplied by 0.824 will give the corresponding amount of nitrogen. In these tables, the expression is in terms of nitrogen.

The law of 1901 abolishes this alternative and requires that the guaranty shall be given in terms of nitrogen. Many manufacturers after complying with the terms of the law, insert additional items in their guaranties, often with the result of misleading or confusing the buyer; the latter will do well to give heed to those items only that are given as the law requires and that are presented in these tables.

A summary of the analyses made this season may be presented as follows:

Summary of Analyses Made This Season.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Number of analyses,	266	71	7	43	34
Moisture, per cent.,	10.10	10.66	7.92	9.86	4.73
Phosphoric acid:					
Total, per cent.,	10.48	11.61	15.26	15.23	22.00
Soluble, per cent.,	4.24	5.29	5.11	8.62	....
Reverted, per cent.,	4.09	4.88	5.10	4.93	....
Insoluble, per cent.,	2.15	1.44	5.05	1.68	....
Potash, per cent.,	3.37	3.35	....	....	....
Nitrogen, per cent.,	1.32	....	2.02	....	3.26
Mechanical analyses of bone:					
Fine,	....	....	....	....	70
Coarse,	....	....	....	....	30
Commercial valuation,	22.90	15.08	25.33	12.97	28.73
Average selling price,	21.87	15.76	22.06	13.45	27.80
Commercial value of samples whose selling price is ascertained,	22.99	15.06	25.33	12.99	29.12

The cases of departure of goods from their guaranteed composition observed this season, including only those cases in which it amounted to two-tenths per cent. or more, were as follows:

Summary of Instances of Deficiency From Guaranty.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Deficient in four constituents,	....	....	....	....	....
Deficient in three constituents,	11	2	....	....	....
Deficient in two constituents,	35	4	....	3	1
Deficient in one constituent,	59	22	2	8	4
Total number of samples in which deficiencies occur,	105	28	2	11	5

The cases of deficiency noted during the past ten seasons in goods as compared with their guaranties expressed in percentage of the total number of goods of each class analyzed, are as follows:

Percentage of Deficiency 1902-1906.

	Spring, 1902.	Fall, 1902.	Spring, 1903.	Fall, 1903.	Spring, 1904.	Fall, 1904.	Spring, 1905.	Fall, 1905.	Spring, 1906.	Fall, 1906.
Complete fertilizers,	40.0	36.7	37.5	37.9	39.5	49.2	35.3	37.5	45.4	39.5
Dissolved bone,	*100.0	50.0	33.3	63.6	†	50.0	‡100.0	66.6	50.0	28.5
Rock and potash,	30.3	43.5	32.9	43.2	50.7	35.3	30.9	33.0	42.4	40.0
Dissolved rock,	15.2	8.9	23.2	20.0	20.0	11.1	9.3	10.0	28.8	25.6
Ground bone,	17.2	25.0	33.3	......	36.3	36.8	40.0	31.4	49.0	14.7
All classes except miscellaneous,	34.2	33.2	35.1	44.7	39.6	41.4	32.8	31.4	43.8	35.8

*Only two samples analyzed.
†Only two samples analyzed for which no guarantees are reported.
‡Only two samples analyzed for which guarantees are recorded.

A comparison of the average composition of all samples of complete fertilizers for which guaranties are recorded with the average of the corresponding guaranties, for several seasons past including those of this season follows:

Average Composition and Guaranty Compared.

	Average composition. Per cent.	Average guaranty. Per cent.
Spring, 1902.		
Phosphoric acid:		
Total,	10.80	9.29
Available,	8.25	7.82
Potash,	3.90	3.66
Nitrogen,	1.62	1.58
Fall, 1902.		
Phosphoric acid:		
Total,	12.58	11.40
Available,	9.95	9.29
Potash,	2.69	2.60
Nitrogen,	1.57	1.55
Spring, 1903.		
Phosphoric acid:		
Total,	11.90	10.67
Available,	9.36	8.73
Potash,	3.85	3.63
Nitrogen,	1.58	1.61
Fall, 1903.		
Phosphoric acid:		
Total,	10.76	9.65
Available,	8.84	8.13
Potash,	4.09	3.90
Nitrogen,	1.33	1.29
Spring, 1904.		
Phosphoric acid:		
Total,	10.24	9.32
Available,	8.27	7.87
Potash,	4.09	3.90
Nitrogen,	1.58	1.55
Fall, 1904.		
Phosphoric acid:		
Total,	10.49	9.72
Available,	8.59	7.70
Potash,	2.87	2.81
Nitrogen,	1.25	1.29
Spring, 1905.		
Phosphoric acid:		
Total,	10.16	9.42
Available,	8.50	7.92
Potash,	4.55	4.22
Nitrogen,	1.61	1.58
Fall, 1905.		
Phosphoric acid:		
Total,	10.63	9.62
Available,	8.72	8.13
Potash,	2.90	2.42
Nitrogen,	1.26	1.20
Spring, 1906.		
Phosphoric acid:		
Total,	9.73	9.21
Available,	7.88	7.77
Potash,	4.21	3.95
Nitrogen,	1.57	1.53
Fall, 1906.		
Phosphoric acid:		
Total,	10.45	9.70
Available,	8.23	8.16
Potash,	3.12	2.95
Nitrogen,	1.32	1.31

It is of interest to note how closely the system of valuations, based upon the wholesale prices of raw materials in the principal markets during the most important buying season and upon certain average allowances for expenses and profits on the part of the mixer and jobber, coincides with the retail prices later ascertained. A comparison for several seasons past is given below:

Comparison of Selling Price and Valuation, 1902-1906.

	Selling price.	Valuation.	Excess of valuation over selling price.
Complete fertilizers:			
1902, Spring,	24.10	25.33	1.25
Fall,	21.83	23.31	1.48
1903, Spring,	24.57	24.15	—.42
Fall,	21.98	22.77	.79
1904, Spring,	24.28	24.99	.71
Fall,	21.82	22.53	.71
1905, Spring,	24.63	25.60	.97
Fall,	21.39	22.35	.96
1906, Spring,	23.55	24.76	1.21
Fall,	21.87	22.99	1.12
Dissolved bone:			
1902, Spring,	16.50	17.35	.85
Fall,	25.30	27.08	1.78
1903, Spring,	31.17	30.87	—.30
Fall,	23.67	24.57	.90
1904, Spring,	31.50	28.42	—3.08
Fall,	24.94	27.77	2.83
1905, Spring,	23.83	22.70	—1.13
Fall,	24.78	25.85	1.11
1906, Spring,	24.40	22.65	—1.75
Fall,	22.06	25.33	3.27
Rock and potash:			
1902, Spring,	16.45	15.05	—1.40
Fall,	15.97	14.46	—1.51
1903, Spring,	17.20	14.74	—2.46
Fall,	15.96	14.86	—1.10
1904, Spring,	16.47	15.46	—1.01
Fall,	15.89	14.92	—.97
1905, Spring,	16.11	15.49	—.62
Fall,	15.97	15.04	—.97
1906, Spring,	16.17	15.19	—.98
Fall,	15.76	15.06	—.70
Dissolved rock:			
1902, Spring,	13.73	13.49	—.24
Fall,	13.54	13.70	.12
1903, Spring,	15.13	13.34	—1.79
Fall,	14.64	13.12	—1.52
1904, Spring,	14.59	14.05	—.54
Fall,	13.89	14.09	.20
1905, Spring,	13.64	13.86	.22
Fall,	12.21	13.51	1.30
1906, Spring,	13.75	12.98	—.77
Fall,	13.45	12.99	—.46
Ground bone:			
1902, Spring,	28.52	26.80	—1.72
Fall,	28.09	27.51	—.58
1903, Spring,	28.67	27.25	—1.42
Fall,	27.52	27.07	—.45
1904, Spring,	28.20	27.70	—.50
Fall,	27.02	27.97	.95
1905, Spring,	29.08	26.72	—2.36
Fall,	27.70	28.70	1.00
1906, Spring,	29.02	28.23	—.79
Fall,	27.80	29.12	1.32

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†From July 1, 1908.
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